The
Electrical Review

VOL. CXXI DECEMBER 10, 1937. No. 3133

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

THE ELECTRICAL REVIEW, DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1.

Telegraphic Address: "AGEEKAY, SEDIST, LONDON." Code, A B C. Telephone No.: Waterloo 3333 (50 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades and has by far the largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to ELECTRICAL REVIEW, LTD., and crossed "Lloyds Bank."

Classified Advertisements-Official Notices-Tenders—Supp. 21.

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The Engineer and Public Speech

WE wonder how many of our rising electrical engineers, after attending the "professional" lecture which was delivered to students of the Institution of Electrical Engineers in London last Friday evening, threw their shoulders back on their homeward way and put to practical test their abilities as public speakers.

The meeting was entertained by Mr. Arthur Duxbury, an exponent of the art of speaking in public, who dealt with the importance of such speech for the engineer, and it may be that some of his audience were led to emulate the example of one of the greatest orators of history by struggling with their known shortcomings in a variety of ways during the week-end. Who knows but that as one result of the proceedings there may be, even as we write, a modern Demosthenes making contortions before a mirror, or correcting impediments by the aid of pebbles in his mouth, or adding to the volume of his voice and gaining control of it by trying to drown the noise of the breakers somewhere around our rock-bound coast?

He may not gain a Golden Crown of either Greece or the electrical industry, but when he masters his powers he will at least have the satisfaction of being able to say precisely what he wants to say with acceptance to his hearers and with satisfaction to himself at engineering meetings or industrial conferences. And that, we shall all agree, will be a great and most desirable achievement.

It may be thought that we have selected an unusual topic for this page, but, as our readers well know, the subject of public electrical speaking is not one of limited interest. We have had some successes, but who can count the failures? We hesitate to hazard even a guess at the number of meetings of electrical and allied institutions, trade and industrial associations and multitudinous committees that are held between the months of September and May; and there is hardly one of them which does not require for its success fluent, precise, pleasant and forceful speech—in argument, in description, and in social felicities. Yet how frequently are our meetings dreary and uninspiring, although there is material enough, if properly handled, to make them full of life and interest.

In his lecture Mr. Duxbury alluded to engineers and others who sought his professional advice to assist them in addressing company meetings, to executives who had to talk to their staffs on salesmanship, and to employés who thought that a little more of the power of speech would enable them to make better use of their technical knowledge or to impress those who were considering their suitability for a better job. He stressed the importance of authors paying attention to delivery when reading papers in public—what pitiful exhibitions one has had to witness! How to prepare to make a neat little speech at the firm's annual dinner without being a nuisance, how to hold an audience when one has a flood of ideas to express—these and many other such matters received attention.

Some of our more experienced readers and writers may regard a large vocabulary as more necessary than it appeared to the lecturer. Surely it greatly adds to that readiness and that freedom from repetition which are so essential to attractive speech.

There was advice on the need for having a well-stored mind, on the compilation of material into the form of a speech, on persistent rehearsal, on the use of notes—if one *must* have them (some of the best public orators have no notes at all).

These and many other things may have sounded to older men elementary, but they are words worthy of attention by many others besides students, for comparatively few seem to have given sufficient thought to the matter. Is it too much to hope that the interest evinced in better public speaking at a students' meeting will reach elsewhere and in time raise the general standard of public speaking in all our assemblies?

Teaching High-voltage Engineering

WHILE Queen Mary College, which celebrates its jubilee this week, is but one of the thirty-five colleges of the University of London, it has at least one feature that gives it a niche of its own. We refer more particularly to the possession of a million-volt laboratory, which, established on the initiative of the College under the advice of Professor J. T. MacGregor-Morris, is receiving valuable support from the E.R.A., the C.E.B., and other public authorities, and is carrying out testing work on behalf of electrical manufacturers. Its true province, however, is to give instruction to graduates in existing high-voltage technology, and also to provide facilities for fundamental research, thus affording opportunities to young engineers in this country that are similar to those available abroad. In view of the cost of high-voltage equipment only a few such academic laboratories are required. Also the number of students wishing to specialise in this manner is, of course, limited, although no doubt it will appreciably increase with the greater use of high transmission voltages. There should be no difficulty, however, in arranging for post-graduate research to be undertaken at a centre with the requisite plant and experience, just as special subjects of other kinds are studied in colleges that have built up a reputation in their different spheres.

Trunk Road Lighting

AN important announcement which was not very widely reported in the daily Press was made at Question Time in the House of Commons on Wednesday last week by the Minister of Transport. Under Section 6 (4) of the Trunk Roads Act, 1936, he can make grants to local authorities for lighting purposes, and he proposes shortly to notify them that, in certain circumstances, he is willing to contribute half the capital and maintenance cost of lighting portions of trunk roads to standards conforming reasonably with those recommended by the Departmental Committee on Street Lighting. This incentive to provide adequate lighting along main routes should have a beneficial effect in persuading local authorities to bring about a commensurate improvement in other roads under their control. An early statement, however, is called for on the Minister's intentions regarding the recommendation that lighting powers should be transferred to larger administrative authorities, otherwise schemes may be held up.

An Echo of 1935

LITTLE has been heard of the National Electrical Co-operative Council which was the outcome of the National Electrical Convention held in 1935. Now, however, the official organ of the Electrical Contractors' Association reveals that there has been some activity. The main concern of the E.C.A. appears to be to straighten out the difficulties between the Association and the electricity supply authorities. A representative of E.D.A. at a meeting of the National Co-operative Committee is reported to have said that co-operation in the industry could be secured by the committees which E.D.A. was to form for the purpose. Later these committees were duly formed, but the one dealing particularly with contractors' matters decided that it was beyond its powers to deal with many of the difficulties existing as between the contractors and the supply authorities. The earlier meeting was adjourned to enable E.D.A. to submit its proposals to the National Committee, and apparently the Association has now done so and at the date of our contemporary's report a meeting had been convened.

The Torquay Exhibition

ONE of the most useful features of the annual convention of the Incorporated Municipal Electrical Association is the exhibition which E.D.A. arranges during the period. This gives manufacturers, particularly those concerned with domestic apparatus, an opportunity to show and demonstrate their products to some of the largest buyers who are responsible for hire-purchase schemes and the arranging of showrooms. Apart from the British Industries Fair there is no electrical display of a national character in which these manufacturers can participate, and so most of the leading concerns take stands at the I.M.E.A. exhibition. Space in the exhibition to be held at Torquay next year (May 23rd-28th) is now being booked up, and firms desiring to take part are asked to communicate with E.D.A. at 2, Savoy Hill, London, W.C.2.

Cheap Electricity

ORGANISED bodies of consumers might do good work in expressing the requirements of the public with regard to electricity supply and electrical apparatus, but not if they are unable to recognise certain elementary facts, such as that cheap electricity does not mean merely a low lighting flat rate. One of the points in a national petition of the Electricity Consumers' Association is, we understand, that the charge for electricity shall never exceed 3½d. per kWh. This takes no account of economic conditions, and the organisers would do better to ask that the running charge of a two-part tariff should be low enough to encourage the use of electricity for all purposes. Only twenty-four of the eighty-one undertakings in London and the Home Counties offer 3½d. per kWh or less as a lighting flat rate, but thirty-seven include a rate of ½d. per kWh or less in their domestic tariffs, at least in the winter. Happy householders in Gravesend, for example, pay secondary rates of ¼d. in the summer and ½d. in the winter, subject to discounts for quantity, but the lighting flat rate is 7½d., also subject to discounts. No doubt the large majority of consumers there are satisfied with the working of the principle that those who make use of the facilities provided should not be mulcted for the benefit of those who do not.

Successful Rural Work

AFTER four years of operation the Dumfriesshire rural electrification scheme has produced results that are most encouraging. It provides an excellent example of its type, since it was started primarily with the definite object of making supplies available to practically everybody throughout a large area that is mainly agricultural (Dumfries Burgh is excluded) and is not dependent upon an urban centre to recoup losses in the earlier stages. No contributions or guarantees have been exacted for connections within two miles of the mains, and the charges for electricity and hiring facilities have obviously been such as to attract consumers with small incomes. There was nothing in the discussion (reported in this issue) on the I.E.E. paper of Mr. J. S. Pickles to controvert the author's submission that it is commercially feasible to give supplies not only to villages and townships but also to isolated farms. Whatever obstacles there may be in the way of achieving equally good results elsewhere, it is certain that the information given by Mr. Pickles will be an invaluable guide in any comprehensive scheme of rural development.

Electricians' Wages

THE rates of wages in the electrical contracting industry adjusted in May this year were to remain in force up to next June. In accordance with an agreement between the N.F.E.A. and the E.T.U. made in 1935, it has been decided that an earlier revision shall be made on account of the rise in the cost of living. Accordingly, the current rates will remain in force up to and including the first pay-day in February; thereafter an increase of ½d. per hour in the wages of all grades will be granted, and this scale will operate up to and including the first pay-day in June next. The new scale of wages is given in our "Business Notes."

Large Steelworks Extensions

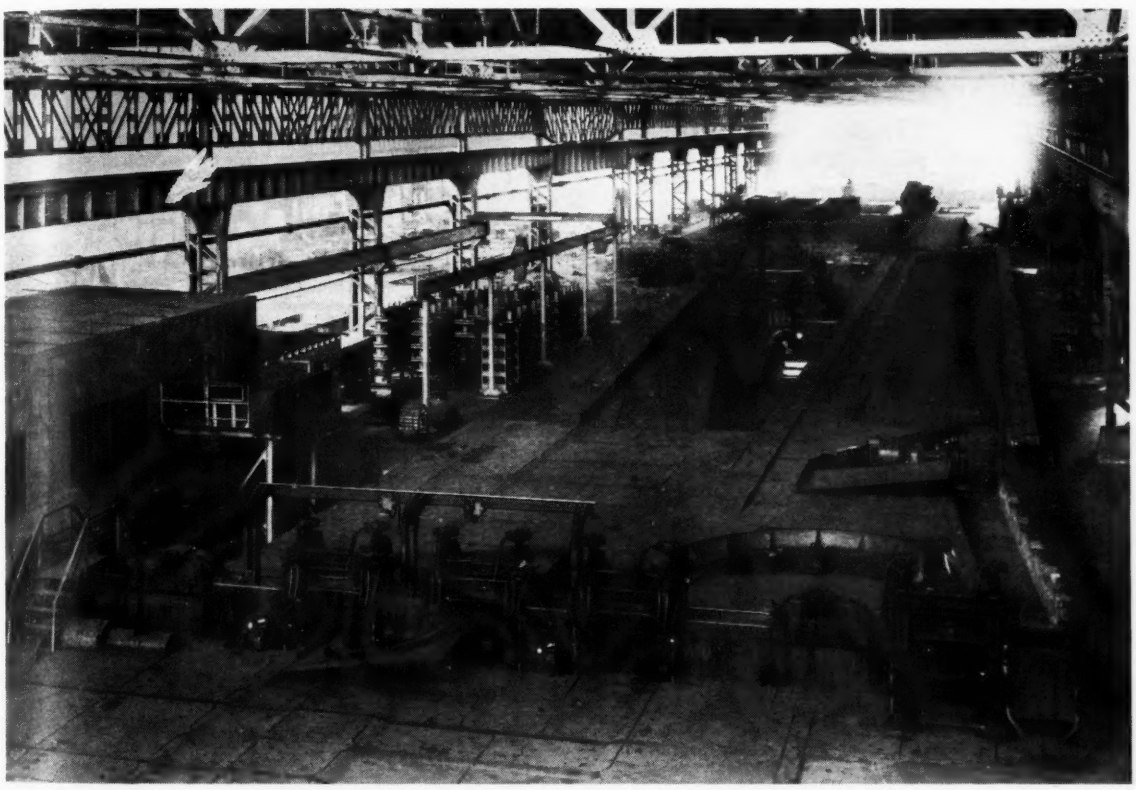
Generation and distribution problems

The Cleveland works of Dorman, Long & Co. consume two million kWh a week, mainly "home produced"

AN electricity consumption approaching 2,000,000 kWh per week by one works raises problems of generation and distribution which are uncommon in this country. By the courtesy of Dorman, Long & Co., Ltd., we were recently afforded the opportunity of seeing the new plant at their Cleveland Works and are able to show the influence of such large extensions on the electrical problems to which we have referred.

In the main, the new plant consists of coke-oven batteries which will produce 13,000 tons per week, complete with coal-handling, receiving, blending and pulverising equipment, an installation for the recovery of such by-products as tar, ammonia and benzol. A complete merchant mill and a cogging-mill drive.

Covering an area of 975 acres adjacent to the Cleveland Hills in which the company mines a substantial proportion of its iron-ore, the works has a blast-furnace capacity of 12,500 tons of basic iron per week and an open-hearth capacity of 13,500 tons of steel per week. Up to two years ago the whole of the electricity used in the works was generated on site at 60 cycles. Because of the intention to change over to standard frequency eventually, and because of the policy of standardisation of equipment as far as possible for all the works of the organisation, it was decided to install 50-cycle motors with the new plant, and to facilitate this it was contracted to take a supply at 50 cycles.



General view of the finishing end of the merchant mill

Frequency-change Plant

A 7,500-kW Parsons turbo-alternator has recently been installed for 50-cycle generation, and to permit an interchange between the 60-cycle and the 50-cycle systems a 4,500-kW B.T.H. frequency changer will soon be put down. For the 60-cycle generation there are two 5,600-kW turbo-alternators. All the turbines take steam from boilers fired by blast-furnace gas and supplying also blast-furnace blowers and a 42-in. cogging mill drive. Retention of this steam drive is largely dictated by the low-pressure steam requirements of blowers which use its exhaust.

Advantage has been taken of the opportunity thus afforded to adopt higher voltages for some of the new motors and so the 50-cycle generator supplies at 11 kV. Generally, for motors from 100 h.p. to 500 h.p. 2,750 V is employed, while 440 V is used for smaller motors.

The coal-handling plant for the coke ovens is designed to deal with 21,000 tons per week of five sixteen-hour days.

Through a receiving hopper and inclined elevators and shuttle-belt conveyors, coal is delivered to blending bunkers which have underneath them special separately motor-driven feeder conveyors with variable-speed gears, so that various classes of coal can be delivered on to a central conveyor at given rates for the required mixing. The central belt delivers coal to Jeffrey-Diamond hammer-type pulverisers, the three of which will deal with 750 tons per hour, and are each driven by a 200-h.p. 2,750-V B.T.H. induction motor. The crushed coal is delivered to a 4,500-ton service bunker from which the ovens are fed by sliding-contact-fed chargers. The whole of the conveyor system is arranged so that the conveyors start up in correct sequence and so that all the drives behind any halted conveyor shut down automatically.

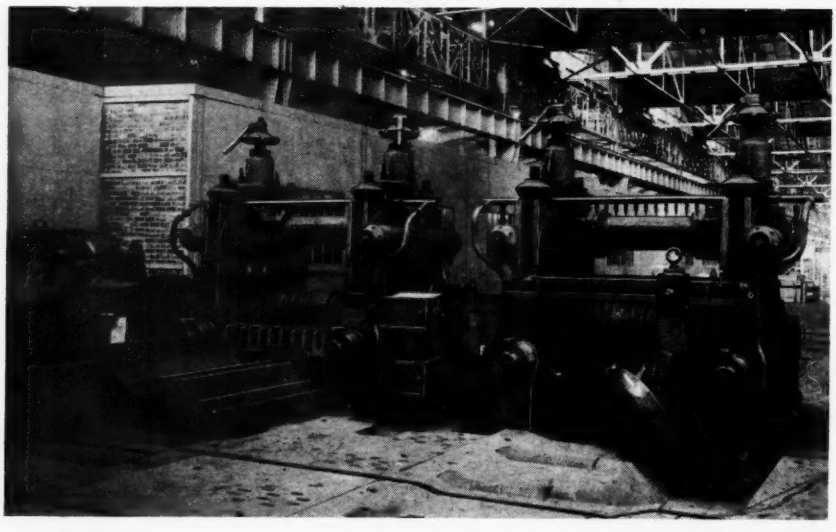
The 136 coke ovens are arranged in two batteries and the necessary reversal of the gas and air valves to permit the regenerative working is automatically operated by two reversing winches, one for each battery. The winches are motor driven and time-switch controlled so that relays effect automatic reversal every half-hour. On the Wellman pusher machines four drives serve the travel, ram, leveller and guide and are controlled by Allen West traction-type equipment. To permit slight motions for lining-up, the interlocking system can be disconnected by a pedal switch, while the cutting out of the wiring for the interlocks by another switch prevents a complete hold-up in the case of a fault until the arrival of the wiremen.

Two electrical features of the quenching installation are the automatic timing of the operation and the float control of the 1,000-gal. per minute pumps serving the feed tanks. Under the coke oven receiving hoppers is a sub-station which is one of the two connecting points in a new 11-kV ring main. Reyrolle switchgear controls two 2,000-kVA, 11-kV to 2.75-kV transformers, and high-voltage secondary distribution is effected through a similar board on the 2,750-V side, while a suitable transformer and switchgear are installed for a 440-V supply.

After treatment in a primary condensing plant the gases

from the coke ovens are passed through the treater chambers of a Simon Carves-Ferranti electrostatic precipitation detarring plant. Charged at high potential, the wire electrodes in the vertical tubes of the treaters ionise the gases or tar fog, with the result that globules make impact with the tubes and are disintegrated. There is a 99.9 per cent. removal of tar. The high voltage is obtained from Westinghouse metal-oxide rectifiers fed from a 1 to 75 step-up transformer served by a moving-coil voltage regulator. The gases are exhausted by turbine-driven units and passed on to the remaining components of the by-products plant.

Home Office requirements for the electrical equipment of the exhauster house are naturally severe, and one of the schemes designed to meet those requirements is the installation of starting equipment for motors in the exhauster house in separate buildings. For instance, in one annexe we saw star-delta starters which serve 35-h.p. motors for circulating benzol-carrying liquor. The starters are operated by flame-proof push-button units near the motors. In another house there are auto-transformer starters which serve 110-h.p., 2,750-V motors and are also operated by flame-proof push buttons.



Roughing stands of merchant mill

An interesting group of pump drives in a central pump house in the recovery plant includes three 160-h.p. Crompton Parkinson motors, two 110-h.p. E.C.C. machines and two 35-h.p. English Electric motors, as well as a neat board of Allen West auto-transformer starters.

The New Merchant Mill

Three outstanding electrical features of the new merchant mill are the d.c. supply for two of the main drives from a mercury-arc rectifier, individual roller drives and the rather tricky automatically operated cooling bed equipment. Normally the mill deals with 5 ft. by 6 in. square blooms received from the steam-driven mill and treated in a continuous pusher-type Priest furnace which delivers them automatically to the live roller table of the roughing section.

The blooms are lifted on to the furnace feeding table by a crane-suspended magnet and the lifting table is motor operated by means of pedal switches near the levers which control the hydraulically operated pusher gear. The furnace is of the regenerative type with a 10-minute period of reversal which is controlled automatically by Igranic equipment. A timing relay consists of an induction motor driving a cross-head which reverses at the end of its travel. This relay controls the operation of the motors for the gas and air valves.

Mr. J. A. Braidwood, B.Sc., the works electrical engineer, to whom we are indebted for help in preparing these notes, said that since the first week's running in April this year this gear has just gone on doing its duty without the slightest trouble of any kind.

The 22-in. roughing section of the mill was made the subject of an 11-kV motor drive, and a feature of this is the extended bedplate which facilitates handling in a position remote from the main-building cranes. The stator can be slid along the bed, leaving the rotor exposed for repairs. The motor is started up by a liquid controller and it runs with a fixed resistance in the rotor which affords a reasonable "slip."

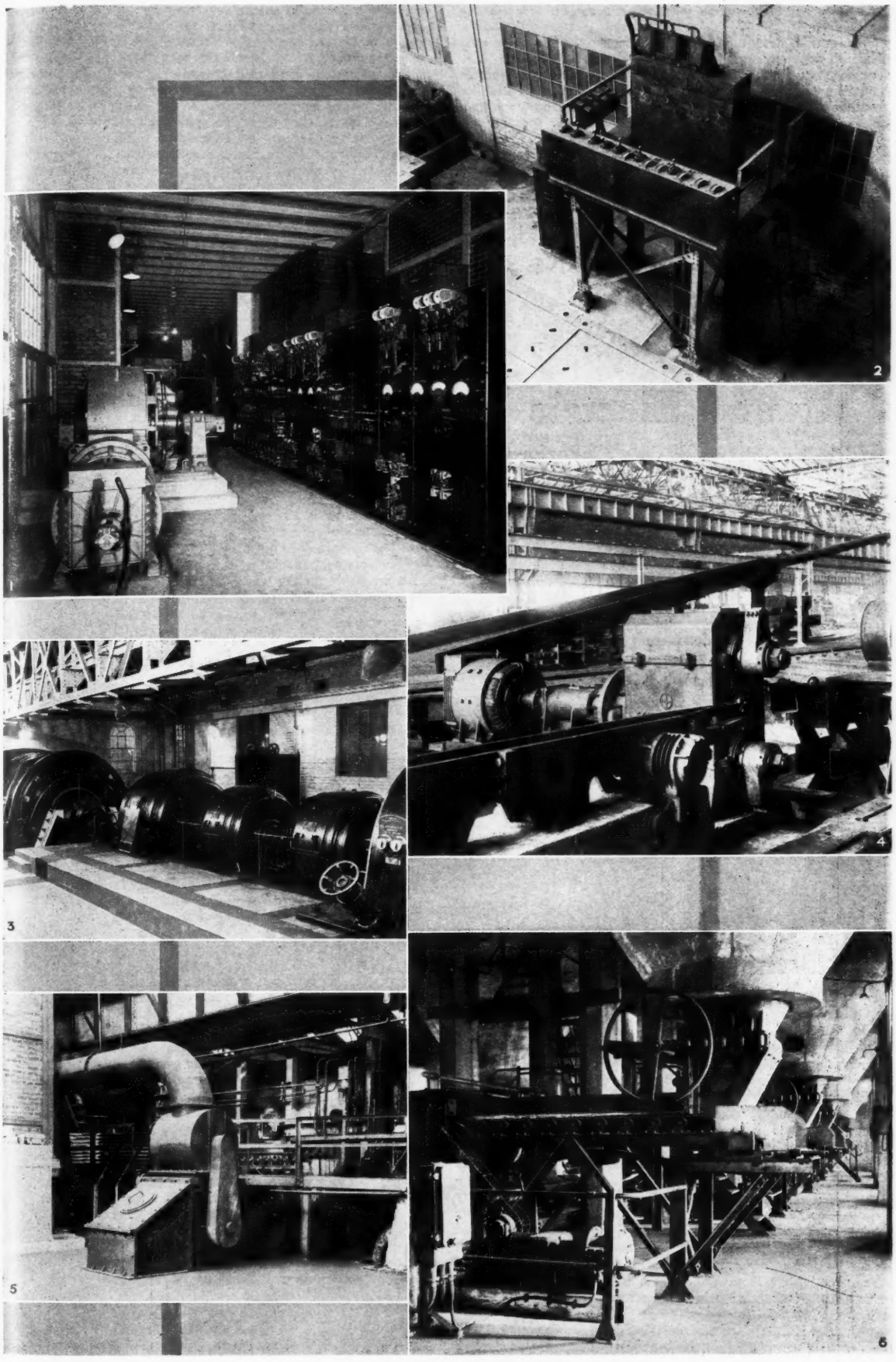
Electrically driven manipulators handle the blooms from pass to pass in front of the roughing unit, and behind it lifting tables raise the blooms for the return to the top passes. One of the lifting-table motors which we inspected is a 50-h.p. 500-r.p.m. machine and it drives the vertical "plungers" of the lifting gear through an enormous crank shaft. Three stands of the finishing mill are driven by a 1,000-h.p. 400 to 960-r.p.m. 500-V d.c. motor and the remaining two stands are driven by a 400-h.p. 300 to 600-r.p.m. 500-V d.c. motor. The speed range for the rolls in the first stands is 125 to 250 r.p.m., and the corresponding range for the rolls of the final section is from 175 to 350 r.p.m. On its way to the cooling bed the rolled product for the finishing stands is made to pass through an automatically operated rotating shear. Contact with a given section in the roller table remote from the machine results in the two cutting arms (top and bottom of the bar) swinging round in synchronism with the bar which they cut. The centre unit of three discs on the shaft of the shears operates the cutters. Attracted one way this becomes magnetically coupled to the motor shaft for running, and attracted the other way it is brought to a dead stop by the stationary unit on the machine side of the couple. Under the same contact control as the automatic shears a deflector arm in the roller table rises and pushes each new section of bar to one side, while sections of the table itself rise to lift the bars over to the cooling beds in a series of steps. Further, the obliquely arranged rollers of the cooling bed are given a number of part turns with each operation, so that the bars are gradually transported from side to side of the bed in correct alignment.

The sub-station erected for the merchant mill represents the second point on the 11-kV ring main referred to, and it houses an 11-kV distribution board, the rectifier and its transformer, a d.c. board and a motor-alternator frequency-changing set. The 11-kV board has six panels—two incoming, one for the 1,000-kVA transformer for the 440-V supply, one for the roughing section motor, one for the rectifier transformer, and the sixth unit (without a circuit breaker) which houses the transformers for the rectifier auxiliaries. So as to avoid using pilot wires the 11-kV ring is protected by graded time-limit directional relays.

The rectifier has both its main tank and mercury diffuser pump water cooled, and the main fan is thermostatically controlled The d.c. board has seven panels—one for the incoming supply for the rectifier, two for each of the 1,000-h.p. and 400-h.p. finishing drives, one for a 75-h.p. motor driving a straightening machine which deals with the bars from the cooling bed, and one for the 20-h.p. motor driving the shears.

Separately housed auto-transformer starters for motors in exhauster house

The motor alternator supplies a set of table rollers which can be synchronised with the mill speed by altering the speed of the motor and thereby changing the frequency of the alternator between 20 cycles and 50 cycles. There are 270 individually driven table rollers associated with the merchant mill, and most of the motors, which vary in size up to 2 h.p. and have special arrangements for heat dissipation, are supplied on a constant-frequency basis (50 cycles). Special ventilation is not required for this roomy sub-station, but to prevent the entrance of dirt a slight positive air pressure is maintained in the building by a fan in



In Dorman, Long's Cleveland Steelworks

1. Main d.c. switchboard, intermediate mill motor and motor-alternator for table roller. 2. One of the mill control platforms. 3. Cogging mill driving motor (17,000 h.p.) and its Ilgner set. 4. The automatic rotating shears. 5. Priest reheating furnace showing (left) automatic valve reversing gear and forced draught fan. 6. Coal-blending bunkers and feeder-conveyor with variable-speed gear drive

the cable basement which circulates its air up through the machine beds.

The entire operation of the mill is controlled from elevated platforms in commanding positions about the building. The control desks on these platforms carry lever-operated master controllers, adjusting regulators and push buttons, and the switchgear served by the controllers is mounted on a common low-voltage a.c. switchboard. The control gear for the two d.c. main drives operates in conjunction with the d.c. switchboard served by the rectifier. The circuit-breaker on the incoming line on this board is so interlocked with a neutral switch that the latter cannot be opened if the circuit-breaker is closed, or *vice versa*. Acceleration is controlled automatically up to the speed setting of the master controller on a time and current limit basis. Reversing is effected by a separate motor field reversing switch.

By means of repeaters the bar from the roughing section is passed through the finishing section as a continuous operation with an overall reduction from the blooms referred to down to, say, ½-in. round rod.

The 40-in. cogging mill for which a new drive has been recently installed handles ingots weighing up to 7 tons. The motor is a double armature reversing equipment with a peak capacity of 17,000 h.p. It has a full output speed of 60 r.p.m. and a maximum speed of 150 r.p.m. It operates at 1,600 V and is supplied by an Ilgner set with three 5,650-kW (peak) 533-V generators connected in series and a 37½-ton flywheel driven by a 3,500-h.p. 11,000-V slip-ring induction motor. Ward-Leonard control is employed for this drive and a six-unit exciter set consists of the synchronous induction driving motor, an exciter for the generators, another for the mill motor, a compounding exciter and one for the synchronous motor driving the set. An unusual feature of this cogging mill is the quick screw-down operation actuated by a 200-h.p. motor.

Practically the whole of the electrical equipment, including the main drives, switchgear and rectifier for the merchant mill and the cogging-mill motor and its Ilgner set, was supplied by the General Electric Co., Ltd. The motors for the coke-oven plant and for ancillary drives in the new mills were supplied by several of the leading makers.

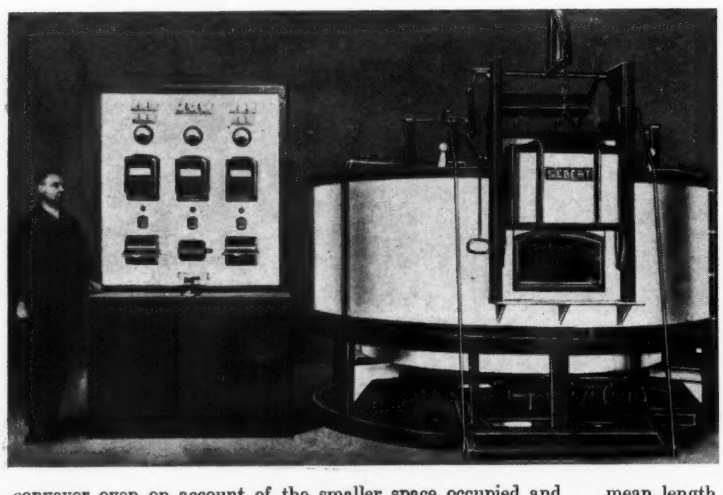
Our thanks are due to Mr. L. B. Cooper, the works manager at Cleveland, for the facilities given to us during our tour of inspection.

Rotary Electric Furnaces.

By A. J. G. Smith

Performance of Continental installations

THE rotary furnace, of the type in which the circular hearth rotates slowly at a speed which ensures completion of the heating cycle in one revolution, although by no means a novelty in this country, has not in the past been so favourably regarded for continuous working as the straight conveyor type of oven. On the Continent, however, rotary furnaces have been developed to a greater extent, and are in use up to 33 ft. diameter. In many quarters the rotary furnace is preferred to the straight conveyor oven on account of the smaller space occupied and its proportionately greater output.



Siebert 120-kW rotary furnace

In the usual layout the circular hearth rotates upon ball or roller bearings which, together with the driving mechanism, are arranged well below the actual heating zone so as to permit of efficient lubrication. The adoption of a movable hearth of this type means that wear due to passage of the work through the furnace is practically eliminated. The circular heating chamber is usually divided into zones of varying heating capacity according to the distance from the door opening.

Although designers as a rule concede the advantages to be derived from direct hearth heating, this is not generally provided in rotary furnaces due to the disadvantages entailed by sliding contact connections and the necessity of varying the temperature of different sections of the hearth to correspond with the temperature of the furnace zone through which it may be passing. Certain makes of rotary furnace are also provided with a loose cover which may be removed, leaving the heating chamber immediately accessible for examination or repairs.

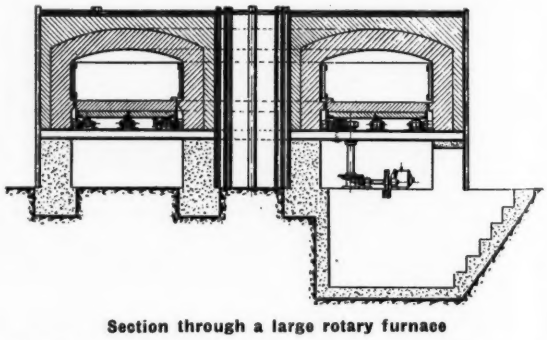
A typical 120-kW rotary electric furnace manufactured by G. Siebert G.m.b.H., of Hanau a.M., has a mean hearth diameter of 5 ft. 7 in., divided into ten sections each approximately 20 in. by 20 in. by 12 in. high, and is suitable for any process involving temperatures up to about 950 deg. C. Heating elements are of chrome nickel, arranged in three groups. Heating up from cold to 950 deg. is usually carried out in 3½ hr., but in this case, as the furnace has been designed for 24-hr. continuous operation, the initial heating-up time is of no particular importance. After heating up, a temperature of 900 deg. can be maintained in the empty oven by 12 kW and in consequence of the careful grouping of the heating elements the temperature variation throughout the furnace does not exceed 2 to 3 deg.

When a rotary furnace of this type is used for case-hardening it is advisable for the work to be packed in round boxes so as to ensure the fullest possible utilisation of the heating space. For this process some interesting results in the way of output and consumption figures have been obtained in a Continental rotary furnace having a hearth mean diameter 5 ft. and a mean length of 15 ft. 8 in., the connected load being 70 kW. In this furnace the average packed weight of the boxes used was 170 lb., and the average net weight of work 82½ lb. per box, the total heating time for the process being 14 hr.

Under these conditions the output per 24 hr. was 17 boxes of a total gross weight of 2,890 lb., or a net weight of work carburised of 1,402 lb. The average consumption for the process was 820 kWh per net ton of work carburised, or 400 kWh per gross ton (comprising the work, carburising compound, and boxes).

A smaller furnace of the same type with a hearth of a mean diameter of 2 ft. 9 in. and a mean length of 8 ft. 7 in., with elements giving a connected load of 25 kW, is in regular employment for the heat treatment of disc wheels up to 12 in. diameter which have to be maintained at 720 deg. for a period of 60 min. Working under these conditions the furnace gives an output of 1,540 lb. in 8 hr., with a current consumption of 245 kWh per ton of work.

These figures show that the rotary furnace is capable of giving very efficient results for certain processes, and it is a type which is deserving of serious consideration for any work involving continuous operation.



Section through a large rotary furnace

Maintenance Repair Practice

By "Works Engineer"

Our contributor deals with the testing of repaired machines to ensure their fitness for former duties

IN repair work theory is not of such importance as it is in new work. The problems met with call rather for a nimble and shrewd brain. No new ways of doing work are required—only the employment of the quickest and cheapest method. After any piece of electrical apparatus has been repaired tests must be made to ensure its fitness to take up its previous duties. While these tests are not so intricate as with new machines they ought to be thorough. For example, the efficiency and power factor need not be checked. A full-load current temperature run and a light load figure, to ensure that the machine has been rewound as before, are usually sufficient.

The tests required are quantative and qualitative. In the

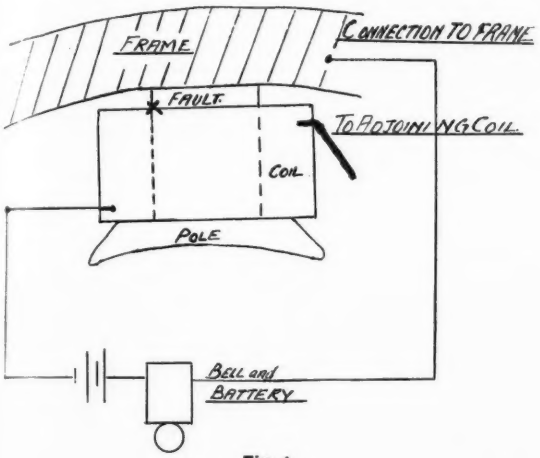


Fig. 1

former category are temperature tests and in the latter commutation and performance tests. Although it is less usual to take efficiency and power factor tests, it is desirable that the instruments for these should be provided. Instruments which should certainly be included are thermometers, speed counters, ammeters, voltmeters, wattmeters and ohmmeters or "Meggers"—all of robust construction and accurate under varying conditions.

Most rewound machines are between 3 h.p. and 50 h.p., and the electrical instruments should be capable of dealing with (*a*) the range of currents and (*b*) the usual differences in voltage. Large alternator and motor rewinds are usually done by the makers of the machines and the average maintenance shop is not laid out to tackle such heavy work.

Frequency of supply has become more or less standardised and a.c. voltage generally varies between 380 and 440 V. On d.c. systems the commonest voltages met with are 110, 220, 250, 400 and 500 V. The ranges of the instruments must cover these values. The thermometer should read up to 120 deg. C.; the speed counter should be capable of reading accurately between the limits of 400 and 3,000 r.p.m.

In the case of d.c. instruments the moving-coil type is preferable. For a.c. circuits dynamometer types are most suitable. Moving-coil ammeters should be provided with a range of shunts, and moving-coil voltmeters with multipliers. They should give full-scale deflections for the working range to ensure accurate results. Sometimes in a.c. work hot-wire instruments are used, but usually they are not so accurate as the dynamometer type. A.c. meters can be supplied with current and voltage transformers to give multiple ranges. Wattmeters require to have coils to carry full current and multipliers for voltage. Insulation tests are always taken with the windings hot as the insulation resistance is lower the higher the temperature and the lowest value should always be taken.

Common Faults

A machine has to undergo certain standard tests if it proves unsatisfactory when given a run-up on the repair shop test bed. The more common faults are earths, short circuits and open circuits. The minimum resistance to earth is given in B.S.S. 168 as rated volts/1,000×kVA output. Thus a 400-V, 8-kVA machine would have a minimum resistance of 1/20 megohm. In practice the resistance is somewhat higher. If the "Megger" gives a zero reading for the machine windings as a whole separate tests are taken on the armature field coils or stator, rotor and brushgear. Brushgear is usually the weakest link. If a "Megger" is not available, earths may be detected by a bell testing set (fig. 1). If the circuit is complete owing to an earth the bell will ring.

Short-circuits can be detected by a "growler" which is usually built up in the repair shop and is as shown in fig. 2. It comprises the core and primary winding of a transformer, the jaws of the core being movable to allow it to take various sizes of armatures or wound rotors. The winding on the armature acts as the secondary of the transformer, so that an a.c. supply is necessary.

The principle is that a current will flow in a short-circuited coil and this will be shown up by the heating of the coil. By increasing the current in the primary the faulty coil will be shown up quite clearly. Also the magnetic flux in the coil will be appreciable and a piece of steel held near it will be attracted.

Open circuits in armatures can also be found by the "growler." The armature is placed between the jaws and rotated and a piece of copper wire is used to short-circuit adjacent commutator bars. On removing the wire from the bars there will be no flash if an open circuit exists.

To check coil reversals and crossed connections the "growler" can again be utilised. The armature is placed between the jaws with a low-reading voltmeter bridging adjacent commutator bars. Normally, two correctly placed coils will give similar readings, but if one coil is reversed it will neutralise the reading of the adjoining coil, giving a resultant low reading. Wrong numbers of turns may be measured or checked up by taking the resistance of the coil or the weight and checking the values against the old coil.

Special care should be taken to ensure that the machine rotates in the correct direction; that the brushes are properly bedded; that the oil rings are clear and functioning properly; and that the grease caps are in position. Sparking at the brushes may be due to incorrect brush pressure or position, dirty commutators or high micas. During rewinds the commutator should always be covered with soft non-abrasive

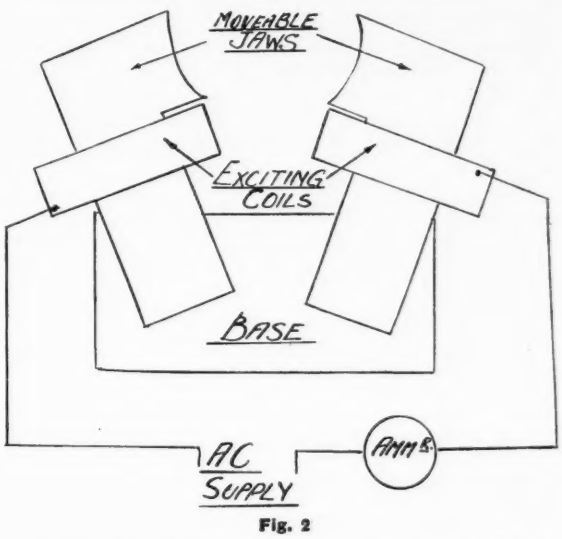


Fig. 2

material to keep it from being scratched or dirtied. Polarity of field coils can be checked by a compass needle.

In a.c. motors the phase currents in the three lines must be balanced, otherwise the phase carrying most current will heat up. Out of balance may be caused by incorrect number of turns per coil when rewinding, or some of the turns may be cross-connected.

If there is any doubt about the workmanship of the repair when being tested by an inspector it is wise to strip off the end shields and give the machine a good look over. Only essential details of the tests taken are noted on the test sheet, which is filed in the repair shop for future reference.

Harmonic Analysis.

By G. H. Rawcliffe, B.A.

THERE are two types of irregular wave form which can be subjected to harmonic analysis. The first is the performance wave of some electrical or mechanical apparatus in which subsidiary effects are actually occurring, with a frequency of some exact multiple of the main effect. The second type is generated by apparatus which is subject only to one periodic effect, this not being what is called "simple harmonic." That is, the "restoring force" is not in linear proportion to the "displacement" of the effect from the mean position (the words "force" and "displacement" must be given the interpretations suited to the machine under consideration). These two types have often been confused by writers on harmonic analysis, who have applied their methods indiscriminately to both, and in their zeal for the technique of analysis have forgotten or misconstrued its physical basis.

Common confusion

A few illustrations will make the distinction clear. The vibration of a string may physically be seen to be of the first type, and suitable instruments will show that most mechanical vibrations normally tend to take place in several modes at once. Hence, one may reasonably assume that a vibrograph which is readily separable into harmonic components has, in fact, been generated by separate modes of vibration. On the other hand, the vibration of a spring in a single mode may not be strictly harmonic owing to a slight departure of the material from Hooke's Law. It would, however, be fantastic to analyse such vibration into its component parts and they would be quite meaningless if obtained. Similar reasoning holds for the harmonic analysis of sound; unless there is previous knowledge of the nature of the sound, the analysis is meaningless.

Divisibility of Periodic Functions

Fourier's proof of the divisibility of any periodic function into a constant term (which is very often zero), a fundamental sine wave and a (normally) convergent series of higher harmonics, was not a discovery of fact but of method. There is no *à priori* reason why every periodic function should be divisible into a series of sine waves rather than a series of waves of any other shape; as, for example, a series of semi-circles alternately positive and negative. The only reason why the sine wave has been chosen is that it is, at least as yet, the only alternating wave form for which a simple expression is available, and further whose first differential coefficient is of the same shape as the original wave form. This last characteristic is obviously a desirable property for waves which are to represent currents and voltages, for it is known that the voltage generated in an inductive circuit is proportional to the rate of change of current.

To show the suitability of series of the trigonometrical functions for representing electrical phenomena mathematically is not, however, to prove the real existence of the elements into which harmonic analysis will divide a distorted wave form. Such a wave form is the current wave for an iron cored choke in which real harmonics are commonly assumed to exist.

A usual line of attack such as given, for example, in Kemp's "Alternating Current Wave Forms," is to apply, we are told, a sinusoidal wave of voltage when only a sinusoidal wave of current can "directly" result. But, owing to the non-linear magnetic properties of the iron, this sinusoidal current cannot cause a sinusoidal flux which, in fact, must always exist with a sinusoidal terminal voltage.

Third Harmonic Voltage Wave

Therefore, we postulate a third harmonic wave of voltage set up by the iron—how is not quite clear—which generates a third harmonic current and flux. This harmonic, in its turn, generates a higher one, and with each further harmonic the flux wave is more nearly forced back to the sinusoidal form. If anyone prefers to assume that a sinusoidal voltage cannot produce "directly" a non-sinusoidal current, and then, when apparently his hypothesis has been contradicted, to apply this sort of argument to correct matters he is not, of course, wrong. To my mind, however, this method is incredibly perverse and very cumbersome. It seems simpler to accept the axiom that a sinusoidal voltage *will* produce a non-sinusoidal current "directly" in any circuit where the coefficient of self-induction is not independent of current.

In general, it is easier and more direct to deduce flux from voltage and current from flux, rather than current from voltage and then flux from current. A sine wave of voltage will always produce a sine wave of flux, regardless of the properties and dimensions of the circuit; and, knowing this flux wave and the particulars of the iron circuit, the current wave can be directly obtained. If desired, the current wave can then be divided into its hypothetical components. The current wave for an iron cored choke is, in fact, an excellent example of the second type of performance wave referred to in the introduction.

At first blush, since the iron is demagnetised with twice the supply frequency, one might expect harmonics of twice, four times, or other even multiples of the main frequency; harmonic analysis will show "only odd harmonics present, since there are equal positive and negative half waves with ordinates occurring in the same sequence for both halves." It is obvious, however, that there can be no real effect of an odd multiple of the fundamental frequency and, hence, the need for understanding the meaning of the harmonic analysis.

The harmonics in the air gap wave form of an induction motor are really of both types. On the one hand those obtained from analysis of the non-sinusoidal magnetomotive force are hypothetical. The slot harmonics, on the other hand, are physically real. The "crawling" of squirrel cage motors has always been associated with particular slot combinations, and this supports the view that crawling is due to the stator or rotor slot harmonics and their interactions, rather than to "Fourier harmonics." It is at least doubtful whether a motor ever crawled on a pure "Fourier harmonic." It is always stated in text books that the most important harmonics are those of the $(2q \pm 1)$th order, where q is the number of slots per pole. But $\sin (2q+1)\ \theta + \sin (2q-1)\ \theta = 2 \sin 2q\ \theta \cos \theta$, in which latter form the two major harmonics combine to give a ripple the width of one slot pitch and varying in amplitude from zero to maximum once per pole pitch. This is exactly the physical form which a slot harmonic would be expected to take.

It is also misleading to refer, as is often done, to "high frequency harmonics," witness the following extract from a well-known book on electrical design. "When full pitched windings are used for induction motor stators, the revolving field consists of a fundamental and harmonics. If there is a pronounced nth harmonic, the resultant revolving field may be considered as the resultant of a fundamental which revolves at synchronous speed and of an harmonic which revolves at n times synchronous speed." Anyone trying to learn from such a book might well be forgiven if he asked why, therefore, the harmonics did not make the motor rotate at n times the synchronous speed rather than $1/n$th of it. The frequency in space, at a given moment of time, is n times the frequency of the fundamental, but that is not the natural meaning to be attached to the words.

Time and Space

The word "frequency" is inextricably associated with time, whereas these Fourier harmonics are harmonics in space. In textbooks on a.c. theory it is often doubtful whether one is supposed to be considering the conditions at various points in space at a fixed instant of time, or at consecutive moments of time at a fixed point in space, or whether there are supposed to be three simultaneous variables.

Very few people can reason directly with three variables, and most find it necessary to deduce the effect of two variables, the third being supposed fixed, and then to relate this resultant to the third variable. This is, incidentally, the layman's equivalent of the mathematician's double integral, and is an example of the method of mathematics applied without its technique. Easy and indefinite passage from space variations to time variations is doubtless pardonable in a paper setting out original work when a high degree of comprehension may be expected of the reader; it is deplorable in textbooks which are presumably written to instruct others and not to record the author's knowledge.

The only excuse for the continued production of new textbooks on old subjects is that the author, at any rate, believes that the treatment is clearer and more meaningful than that hitherto available. The "dry bones" of many a theoretical process, such as harmonic analysis, have been rehearsed by so many authors that it is now far more necessary to emphasise the objects, limitations, and meaning of the process than the details and method of carrying it out.

How often, on displaying a curve with a kink in it, one hears the glib comment "third harmonic present." This is to mistake a label for an explanation, and merely to substitute one word for another. It reminds one of the definition of an archdeacon as an ecclesiastical dignitary who performs archidiaconal functions. An harmonic analysis must be regarded solely as an aid to the calculation of certain results, or as a means of reducing irregular phenomena into a form from which approximate deductions may be drawn. Only when, on physical grounds, some meaning can be assigned to the harmonic components can one be justified in treating them as real.

The New Factories Act. By J. W. Thomas, B.Sc., LL.B.

How its provisions affect the engineering industry

THE new Factories Act which comes into operation on July 1st, 1938, is the most important piece of legislation dealing with factories since 1901, and whatever critics may say of its defects and shortcomings, it certainly represents a big step forward in the direction of ensuring greater protection for those engaged in industry. It both amends and consolidates the existing law, and in view of the far-reaching nature of its provisions it is very necessary that those who are owners and occupiers of factories or who have charge of machinery in them should make themselves familiar with its contents.

Mr. H. Samuels, in a book on the subject,* has lost no time in presenting to the public an annotated text of the Acts, thus affording ample opportunity for those interested to study it in detail and under proper guidance before it comes into force. One of the most important amendments is the elimination of the term "workshop" and the bringing of both workshops and factories into a common category. Under the present law the distinction had become somewhat unreal and difficult to apply, and many anomalies will now be elminated.

It is not possible to cite all the main provisions and one can only refer chiefly to those which are new or of particular importance to engineers. Attention is drawn to the changes in the existing law in the notes which the author has compiled and also in his introduction. The first part of the Act deals with general provisions for health.

A review of the principal requirements of the new Act which comes into force during next year.

Factories must be kept clean and in a state which is not inimical to the health of those employed in them. Walls must be periodically cleaned or whitewashed except in factories where mechanical power is not used and fewer than ten persons are employed, unless factory inspector requires otherwise. Overcrowding must be prevented by the provision of ample cubic space per person employed, and in this connection a minimum figure of 400 cu. ft. per person is laid down. A reasonable temperature must also be maintained in a factory. The Act does not indicate what a reasonable temperature is but leaves it to be decided by the Courts. Generally, where work is done sitting, the temperature must not be less than 60 deg. and thermometers must be provided. There must also be adequate ventilation and the necessary standard can be prescribed by regulation.

Sufficient and suitable lighting must be provided and this also may be prescribed by regulation. This provision in the Act implements the recommendations made by the Committee on Lighting in Factories, and compliance with it is under the control of the factory inspector, whereas ventilation, cleanliness, overcrowding and temperature in factories where no mechanical power is used are matters for the district council. Where the district council fails to carry out its duties the Secretary of State may authorise an inspector to do so.

Ensuring Safety

The Act makes many amendments to the existing law on safety. The general effect is to make it obligatory that every moving part of machinery, prime mover, generator, motor and transmission machinery must be securely fenced unless it is in such a position or of such construction as to be as safe to every person employed or working on the premises as it would be if securely fenced. Many cases are cited in the book, all of which support the principle that the obligation to fence is absolute and that it must be done securely.

A recent case, Findlay *v.* Newman, in which the Divisional Court directed the Justices to convict for a breach of the provision to fence, illustrates the misapprehension which still appears to exist regarding this absolute duty. Not only is fencing required but sufficient devices or appliances must be provided and maintained by which the power can be promptly cut off. The various safety provisions cannot all be enumerated here in detail but they deserve close study by all who are responsible for machinery. Where the Secretary of State is satisfied that there is available and suitable for use in connection with machinery any type of safety device which prevents the exposure of a dangerous part of machinery whilst in motion or stops a machine forthwith in case of danger, he may make regulations directing that such a device shall be provided.

What is a dangerous part of machinery is a question of fact for the Court. It means machinery from which in the ordinary course of working it, danger may reasonably be anticipated, even if it arises from negligence. Usually the fact that injury has been caused is strong *primâ facie* evidence that the machinery is dangerous. There are special provisions in the Act allowing for examination and lubrication but only where it is carried out by persons over 18 years of age.

Set-screws, bolts and keys on revolving shafts and pinions, &c., on machinery must be sunk, encased or otherwise effectively guarded so as to prevent danger, and all gearing must be encased. If any person sells or lets on hire for use in a factory in the United Kingdom, a machine intended to be driven by mechanical power which does not comply with this requirement he is liable to penalty. This provision is a new one.

Vessels, sumps and pits containing scalding, corrosive or poisonous liquids in which persons are liable to fall must be fenced. Women and young persons must not clean any machinery whilst in motion, and no young person shall be allowed to work at any machine which the Secretary of State deems to be specially dangerous, unless he has received sufficient tuition and is under adequate supervision. This also is a new requirement in the Act. Detailed provisions regarding hoists and lifts in respect of construction, strength, protection, safe loading and inspection are set out, and there are similar provisions in connection with chains, ropes and lifting tackle, cranes and other lifting machines.

Every staircase must have a substantial hand-rail on its open side or sides, and all openings in floors must be securely fenced. Protection must also be provided for people who have to work in a place from which they are liable to fall a distance of more than 10 ft. Where work has to be done inside a chamber or tank in which dangerous fumes are likely to be present there must be a suitable man-hole for egress, and before persons are allowed to enter all practicable steps must be taken to remove any fumes which may be present.

No work is to be permitted in any boiler furnace or boiler flue until it has been sufficiently cooled by ventilation or otherwise to make work safe for the persons employed. Plant containing explosive or inflammable substances must not be subject to welding or other heating processes until all practicable steps have been taken to remove the fumes or make them non-inflammable.

The provisions regarding steam boilers have been elaborated and strengthened, and their application has been extended to economisers and super-heaters. Twenty-eight days are allowed for the entry of the report in the register instead of fourteen. Steam receivers and containers and air receivers in which the pressure exceeds that of the atmosphere are brought within the Act and special provisions apply to them. They must be fitted with stop-valves, safety valves and pressure gauges, &c. The provisions in the 1901 Act appertaining to escape from fire have been extended so as to apply to all factories in which more than twenty persons are employed or where more than ten are employed above the first floor. In every factory employing more than twenty above the first floor or on a level more than 20 ft. above the ground, or where explosive or inflammable materials are kept, the employés must be given fire drill. Every factory to which the above provisions apply must be certified.

Hours and Overtime

The rules regarding hours of labour for women and young persons in all factories have been simplified, and the normal daily period will, under the new legislation, be eleven hours between 7 a.m. and 8 p.m., though the maximum hours of work permitted will be nine per day and forty-eight per week. After July 1st, 1939, young persons under sixteen will not be allowed to work more than forty-four hours per week. There are also rules in regard to overtime, the general effect of which will be that women and young persons under sixteen will not be permitted to work more than 100 hours a year overtime unless permitted by the Home Secretary, where there is some special reason, but in any case not more than 150 hours. The maximum overtime workable in a week will usually be six hours, though again this may be increased in certain circumstances by permission of the Home Secretary.

*"The Factories Act, 1937." By H. Samuels. (Pp. 584.) London: Stevens & Sons. 30s. net.

The most important Section is 151, which contains a revised definition of a factory as meaning any premises in which or within the precincts of which persons are employed in manual labour in any process for or incidental to the making of any article or part of an article, the altering, repairing, cleaning, &c., of any article, or the adapting for sale of any article, the work being carried on by way of trade or for purposes of gain. The definition also includes a number of specified premises in which persons are employed in manual labour. The essential feature in all of them is that manual labour must be employed, but there are some premises, namely, those where electrical plant and apparatus are installed, in which manual labour may not be employed, but which may be subject to some of the provisions of the Act.

The application of the Act to electrical stations has been dealt with in a previous article (ELECTRICAL REVIEW, August 6th, p. 180). The meaning of the term "manual labour" is briefly discussed by the author and certain cases are cited. It is pointed out that though the words do not necessarily mean the same as in the Employers' and Workmen's Act, 1875, the decisions under that Act (and one might also mention the Workmen's Compensation Acts) are instructive as throwing light upon the meaning.

The Act makes a number of alterations in the general administration of factory law and legal proceedings arising therefrom. The general register and other records must be kept available for inspection by the factory inspector or examining surgeon for a period of two years.

Under the 1901 Act it is the occupier of a factory upon whom the responsibility falls for compliance with its provisions, but the new Act makes the owner responsible in respect of overcrowding, ventilation, cleanliness, temperature and lighting, and makes him also responsible with the occupier for compliance with the safety provisions.

The duty of complying with the Act falls not only on owners and occupiers but also on employés. They must not wilfully interfere with or refuse anything provided for their health, welfare and safety. They must use every such appliance provided, and they must not do anything to endanger themselves or others.

Proceedings for any breach of the Factory Act or the regulations made thereunder may be taken against a director or officer of a limited company who is responsible as well as against the company itself. The present law provides that the occupier of a factory may have the person actually responsible for a breach of the Act brought before the Court at the hearing of a summons. Under the new Act three days' notice must be given to the prosecutor of his intention to do so. The penalties for certain offences are also increased.

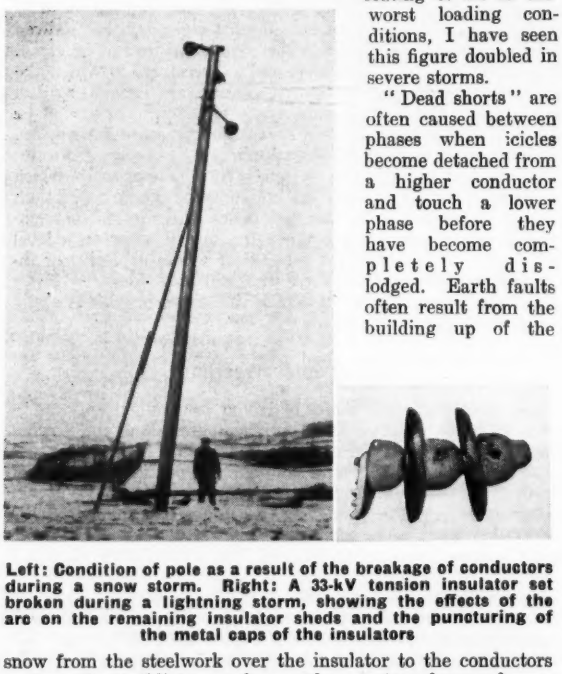
The appendix contains the text of the Employment of Women and Young Persons Act, 1936, the regulations for dangerous trades, welfare orders and other Orders in force. The index appears to be very complete and detailed, and this, with the table of leading cases and ample notes which are included makes the book a highly valuable work of reference on the new legislation.

Storm Damage. By John McCombe, Ph.D., A.M.I.E.E.

Effects of wind and snow

WIND storms in Great Britain usually cause less damage to overhead high-voltage lines than do snow and lightning. They have little effect on pylons or masts, but wood poles may be blown out of plumb. Branches of trees, however, may be thrown across the conductors, resulting in either a "short" between phases or a phase-to-earth fault in damp weather. Bunches of hay also may be blown on to the conductors and, if not observed on patrol, may work along them and cause an earth fault at a later date. In most rural schemes this has been got over by the fitting of twig guards, those on the top conductors being approximately 3 ft. from the insulators and those on the lower conductors 2 ft. out. In my own experience this practice has greatly minimised the number of faults due to such causes. Cessations of supply, however, are not generally caused by wind storms.

Severe snowstorms cause considerable damage to overhead high-voltage lines. Difficulties of transport combined with dislocation of the telephone service make snowstorms much more severe than they otherwise would be. Snowstorms usually result in broken conductors due to overloading with snow and ice. While the regulations allow for ½ in. radial coating of ice as the worst loading conditions, I have seen this figure doubled in severe storms.

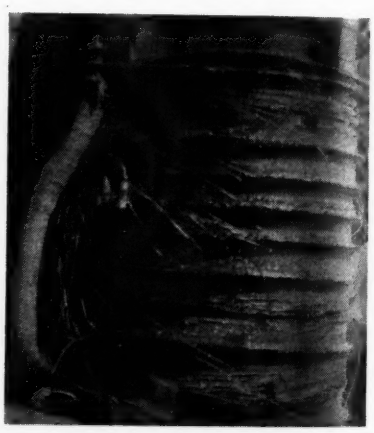


Left: Condition of pole as a result of the breakage of conductors during a snow storm. Right: A 33-kV tension insulator set broken during a lightning storm, showing the effects of the arc on the remaining insulator sheds and the puncturing of the metal caps of the insulators

"Dead shorts" are often caused between phases when icicles become detached from a higher conductor and touch a lower phase before they have become completely dislodged. Earth faults often result from the building up of the snow from the steelwork over the insulator to the conductors or from the building up of snow from a transformer framework over the transformer bushings to the connections.

When either of these two conditions exist a mild external report or explosion sometimes occurs. The great drawback, however, is that it may be days before the actual extent of the damage is ascertained, while burns on the conductors may not be detected until the routine patrolling has been carried out.

Lightning storms are usually the greatest enemy of the overhead-line engineer. They rarely give any warning and may occur over a large area. The faults resulting from lightning are numerous and varied. Insulators may be broken or punctured due to flash-over resulting from a lightning surge, while insulators and conductors may be broken when a direct hit takes place. Poles may be burned if a high earth resistance results from rocky strata, particularly where the earthing of individual poles is practised.



Windings of a transformer burned out during a severe thunderstorm

Tension sets may be shattered or the metal caps punctured by the arc of a surge or, last but by no means least, transformers may be burned out. The introduction of expulsion gaps at transformer positions has greatly reduced the number of burned-out transformers. Whether the transformer is burned out by the incoming or the reflected wave of the surge is still a controversial question.

Atom Tracks Exhibition

An illustration of the great variety of investigations into the structure and behaviour of atoms which have been carried out during the last twenty-five years by means of Professor C. T. R. Wilson's expansion chamber is provided by the exhibition recently opened at the Science Museum, South Kensington. The centre-piece is Wilson's original apparatus of 1911-12 from the Cavendish Laboratory, Cambridge. Over eighty photographs taken by research workers all over the world by Wilson's method are also shown. These indicate (with key diagrams) the paths pursued by flying atomic nuclei and electrons, etc. Another exhibit comprises stereoscopic views of the tracks as seen in their dimensions, while the part played by the expansion chamber in investigating cosmic rays is strikingly displayed. A handbook by Dr. F. A. B. Ward, who has arranged the exhibition, can be obtained at the Museum or from the Stationery Office for 6d. net. The Exhibition will be continued until the end of next February.

Electricity in the Laundry

Equipment at new premises at Mitcham

This mechanised establishment employs 140 h.p. of electric motors with a maximum load of 100 kW.

THE very purpose of a laundry renders the employment of any devices for minimising dirt essential. Not only does this fact render the individual electric drive invaluable on account of its elimination of unhygienic and cumbersome shafting and belting, but its faculty of providing power just when and where it is required gives it an equal importance from the economy point of view.

Apart from the many older laundries which are electrifying their premises as occasion arises, most new buildings are being electrically equipped as a matter of course. A case in point is the Royal Arsenal Co-operative Society's new laundry at Mitcham, where the effect of the electric drive both in minimising handling and in speeding up the various processes can be seen to good advantage.

Arriving at the laundry by vans, the parcels of soiled articles are unloaded into baskets which are taken on trolleys to a 2-ton lift (Champness Bros.). On the first floor they are checked and weighed preparatory to balancing the work through the building. Three conveyors (driven by ¾-h.p., 1,000-r.p.m. motors fitted with Croft & Co.'s reduction gear giving a final speed of 14 r.p.m.), one above another, the top one for paper and string, the middle for small and coloured work needing expert classification and the bottom one for large articles, assist in the work of sorting. From the ten sorting booths the articles are fed into hoppers which automatically weigh them before discharging them into the washing machines on the ground floor below.

For large washes of general goods two "London" machines (A. Legé & Co., Ltd.) driven by 7-h.p., 1,500-r.p.m. motors and capable of dealing with 600 lb. of dry wash are brought into service. Here the clothes stay for an hour. An electrical control system operating much in the same fashion as that of a pianola, governs the admission of the soap, soda ash and blue solutions. Following modern practice, the pipes conveying these solutions are coloured yellow, green and blue respectively, the other service pipes being similarly distinguishable. Incidentally, the colour scheme is carried a stage further and girls employed in the various sections of the work are given distinctive dresses.

Smaller batches of articles are dealt with in correspondingly smaller machines. The two largest are the 300-lb. Lister apparatus operated by 4-h.p., 1,440-r.p.m. motors and fitted with Perrett automatic control worked by water pressure and the 200-lb. Baker Perkins "Prosperity" machine (2.5-h.p., 1,450-r.p.m. motor), which has a two-speed control enabling it to be used for flannel and woollen goods if required. Socks, coloured overalls and similar small classifications find their way into two 100-lb. Cherry Tree general purpose washers (2-h.p., 1,500-r.p.m. motor), while a small Lister "Baby" (1.5-h.p., 1,440-r.p.m. motor) takes care of collars, silks, &c. A Jenner scrubber is provided for neckbands, &c.

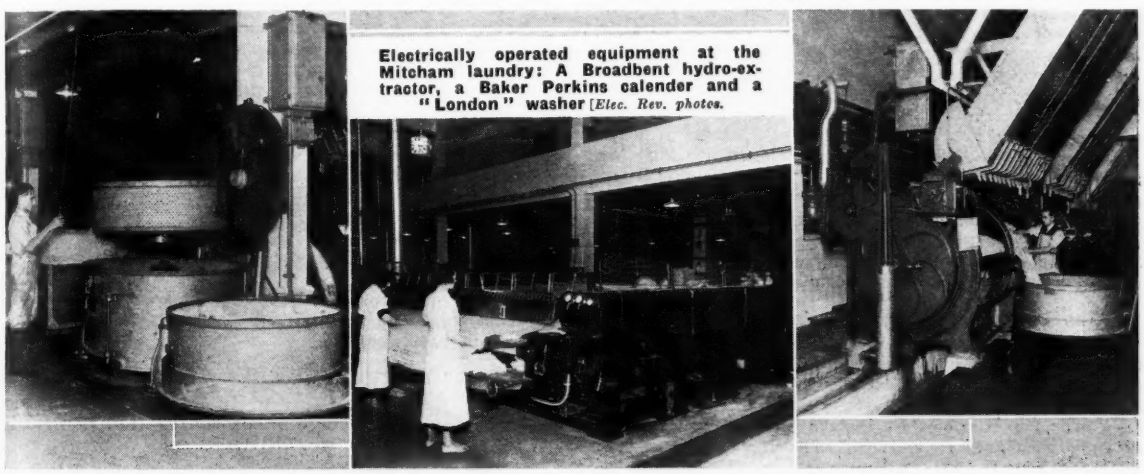
From the washers large batches of clothes are emptied into open containers which are lifted bodily, by means of a Morris hoist, into one of two 48-in. Broadbent hydro-extractors driven by a 15-h.p., 950-r.p.m. motor. After ten minutes in these they are ready for ironing. For drying smaller lots of clothes there are two American Laundry Machine Co.'s machines (3.5-h.p., 1,500-r.p.m. motor) and a smaller Broadbent equipment (6-h.p., 1,480-r.p.m. motor).

Six hundred sheets an hour can be ironed in the six-roll Baker Perkins calender (10-h.p., 1,440-r.p.m. motor) for general flat work. Table linen is separately dealt with on a two-roll Thorpe Medley machine (6-h.p., 1,000-r.p.m. motor) which is fitted with an electric fan to keep the rollers dry by extracting steam through perforations in them. For all other articles too large for the girls to handle a Lister "Swivel Gladiron" is brought into service. A single-roll Brown & Green calender is used for handkerchiefs, while ten "Twin Rapid" equipments cater for general utility pressing. There are four special presses for shirts and two for overalls and coats, a special section of the laundry being provided for finishing the shirts and collars. An Ingersoll Rand compressor, driven by a 10-b.h.p. Lancashire Dynamo & Crypto motor, operates the pneumatic presses. Electric sewing machines (Singer) are used for mending.

Towels, blankets, &c., are dried in a Cherry Tree rotary dryer driven by a 2-h.p., 1,500-r.p.m. motor and fitted with electrically driven fans, which are also a feature of the Thomas Bradford drying rooms for similar articles. Conveyors driven by ¾-h.p., 1,000-r.p.m. and 1.45-h.p., 1,000-r.p.m. motors respectively (final speeds 14 r.p.m.) extend across the finishing section and also along the whole length of the packing and despatch department. The atmosphere of the laundry is kept free from steam by eight large fans (Sturtevant) giving four air changes an hour.

Five 500-W Siemens "Sieray" electric-discharge lamps provide a high intensity of lighting for the centre portion of the works, supplementary illumination for the side sections coming from Benjamin industrial reflector type fittings.

Altogether the maximum load of the building totals about 100 kW and the electric motors installed (most of which are Brook's) represent approximately 140 h.p. All the power equipment is operated at 400 V, a sub-station which also serves the adjoining dairy and bakery premises (described in our issues of December 21st, 1934, and August 9th, 1935) transforming the 400-V, three-phase, 50-cycle supply from the County of London Co.'s mains. To control the supply a neat switchboard, comprising a main Ellison circuit-breaker and Simplex and M.E.M. ironclad switch-fuses, is situated in the balcony on the first floor. The electrical installation work was carried out by the Co-operative Society's own Engineering Department.



Electrically operated equipment at the Mitcham laundry: A Broadbent hydro-extractor, a Baker Perkins calender and a "London" washer [*Elec. Rev. photos.*

Industrial Motors

During a meeting of the Brighton Electrical Engineering Society, which was held at the Brighton Technical College on Thursday, November 25th, with Mr. G. Carr in the chair, Mr. H. West, deputy chief engineer of the Motor Department of Metropolitan-Vickers Electrical Co., Ltd., delivered a lecture, illustrated by lantern slides, on "The Design of Industrial A.C. and D.C. Motors." Mr. West stressed the importance of efficient cooling in determining the satisfactory performance of various types of motors. He also dealt with insulation problems and the peculiarity of faults due to dust and damp, concluding with references to special types of industrial machines.

Protection for Motors.

By T. C. Gilbert, A.M.I.E.E.

Means of improvement

A PAPER recently read before several I.E.E. Centres, entitled "Protective Devices in Motor Circuits," by Mr. J. O. Knowles, takes cognisance, for the first time as far as I am aware, of the desirability of improving leakage protection for motor circuits. The point was especially emphasised in the discussions, but, apart from one convincing demonstration by the speaker, it was discussed only from the theoretical angle.

The ordinary low-current leakage trip has so far received attention in this country only from the standpoint of its suitability where low-resistance earth connections cannot be secured or maintained. The principle is more widely applied in Germany, where it is used for protecting motors up to 350 A. (I am not able to speak from practical experience of heavier switches.) The practice of starting the largest motors direct to line is much commoner in that country than it is here, and in some districts star-delta starters or auto-transformers are rarely employed.

With large motors the presence of even a small resistance in the earth circuit will effectually prevent isolation of the machine or circuit by reason of leakage or earth fault. Taking the case of a motor protected by fuses, running on a 400/230-V three-phase system, if 0.5-ohm resistance is existent in the earth circuit, then there is little chance of this machine being isolated from the supply on account of leakage from the windings. Every such fault must build up into a phase-to-phase short-circuit, so that not only is the motor itself likely to be damaged, but also the protective gear must operate under severe conditions, resulting in possible damage to contactor gear or other protective accessories, in addition to the loss incurred due to the motor being out of use for repair.

> ***Devices for guarding against sustained small overloads and arresting incipient faults***

Fuses and other overload devices are used for the express purpose of protecting a motor against excess current caused by overload, and there appears to be no good reason whatever why any leakage, great or small, should be treated as an overload. Normally, there is very little permanent leakage from an a.c. motor—there is usually more from a d.c. machine owing to the presence of copper dust on brush holders—and the installation of a low-current leakage trip would not result in unnecessary outages for this reason. The 30-mA leakage trip was mentioned in the paper and during the discussion, and this figure is also approved by the I.E.E. Regulations. It has no inherent value, however, and German devices operate at currents up to 100 mA. Whatever the small current selected, the incipient leakage is isolated before it can cause damage, either to the motor windings or to the protective gear, the latter operating at rated current instead of at severe overload.

Comparative Efficiencies

The author of the paper demonstrated by means of a slow-motion film the efficiency of the protection afforded by the ordinary 30-mA leakage trip as compared with that given by a 25-A overload trip.* In the overload trip test the conductive dust used to create a leakage path burned for a considerable time until an explosive short-circuit occurred. In the leakage-trip test there was merely a faint spark when the trip operated, and the insulation was completely restored by blowing away the dust remaining between the studs.

One Continental model, suitable for currents up to 50 A per phase at 500 V, incorporates two overload trips, one magnetic with thermal releases for low, long-period overloads, and the other a low-current leakage trip. The usual test key for proving the continuity of the earth circuit and the trip mechanism is provided. This equipment permits the switching of the motor direct on to the line—a practice that is much commoner in Germany (where the largest motors are so started) than it is here; in some parts of that country star-delta starters or auto-transformers are rarely to be found. Test keys are not, however, incorporated as standard in the switches for larger motors (as the earth circuits in connection with these usually consist of heavy cable armourings or similar low-resistance paths) except in rural areas or in situations where grounds exist for apprehension regarding the efficiency of the earth circuit.

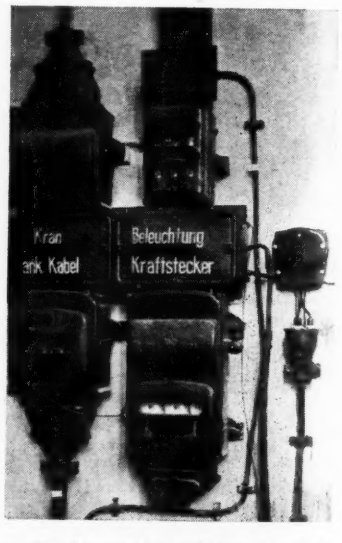
Where starting devices, such as star-delta or other forms, are employed, then the switch is often utilised as a circuit switch incorporating overload and leakage protection and is installed away from the motor, the starting device being mounted externally, often on the top of the machine itself.

A photograph taken by myself in the heavy transformer erection shop of the Rheinisch-Westfaelisches Elektrizitatswerk A.-G., at Wesel, is reproduced. This shows a crane switch on the left fitted with the now usual leakage trip, set at about 75 mA, while the device with the oval cover is a smaller overload and leakage trip—50 mA and 30 mA rating—controlling other equipment. These small devices, housed in moulded insulation covers with mechanism mounted upon steatite, are found in very extensive use in works; the test key is immediately over the operating handle.

No standard of definite operating currents seems to be set abroad, where the values vary widely and appear to be governed to some extent by the size of the switches, and it is generally in connection with the heavier switches that operating currents up to 100 mA are utilised.

If damage to windings, etc., is to be completely eliminated, and the incipient leakage isolated, then operating currents should not rise much above 100 mA. At the same time, I feel that no attempt should be made to limit such currents to 30 mA, if only on the score that heavier currents would permit more robust coil construction. It is sufficient to specify the voltage at which the leakage trip must operate, taking into account the earth electrode and other resistance; combined fault and earth resistances of the order 4,000 ohms will not prevent isolation on ordinary supply voltages.

The bi-metallic thermal type of overload protective device has been criticised as unreliable, difficult to adjust, and too responsive to the surrounding atmosphere for accurate setting, although some such protective device is essential to safeguard the motor against the low, long-continued overload which does so much damage but cannot be cleared by fuses or magnetic overload trips. Special alloy forms are rather common on the Continent. One of these is shown in the diagram reproduced on page 819. The rated current selector consists of a transformer, the primary of which carries the main current, and the secondary is connected to a thermal element. The thermal relay consists of a hollow shaft in which is a heating element, and the eccentric shaft is coupled to the toothed drum by means of an eutectic alloy with the low melting point of 150 deg. C., which, however, is too high to be affected by ambient temperature. A continuous small overload will cause the alloy to soften, and the toothed drum will then rotate under the action of the spring, causing release of the switch mechanism. After release the alloy solidifies almost immediately, and in about two or three seconds the switch can again be closed.



Typical arrangement of industrial motor control gear

The alloy is said to remain quite unchanged after some thousands of operations, and the transformers are so designed that saturation of the iron prevents any damage to the heating elements of the thermal relay. The rated current selectors are arrangements whereby one size and type of switch can be used for many sizes of motor, a rather valuable feature when a motor is hurriedly changed for another of a different horse-power, when it is not desirable or convenient to change the control equipment also.

Overload releases are normally fitted to two phases only, the leakage trip being placed on the third leg of the contacts. No-volt coils are standard, and all releases operate a common bar, so that the leakage trip test suffices to prove the whole mechanism.

Oil tanks are fitted, but up to about 25 A it is not customary to fill these, except for farm use, when the oil prevents the ingress of damp to the contacts and also seems to be some deterrent to insect pests.

* I.E.E. *Journal*, Vol. 81, No. 488 (p. 176).

Meetings and Discussions

Last Friday the Students' Section of the Institution was privileged to hear a lecture of considerable general interest, "The Importance of Public Speaking for Engineers," which is the subject of our leading article this week. The discussion on Mr. J. S. Pickles's I.E.E. paper, "Rural Electrification," yielded some useful information, one point being that in the author's area 200 miles of low-voltage line has been erected without any wayleave rentals being paid, and he has been able to put up 520 miles of high-voltage line at very low wayleave payments.

Public Speaking

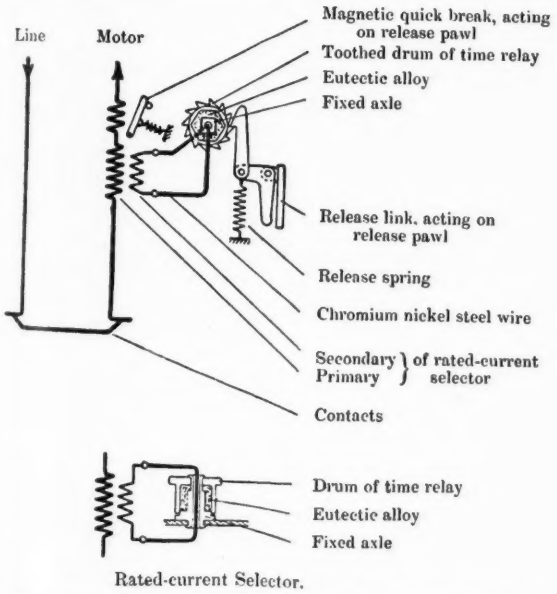
MR. ARTHUR DUXBURY gave a lecture before the Students' Section of the INSTITUTION OF ELECTRICAL ENGINEERS on December 3rd, on "The Importance of Public Speaking for Engineers." The speaker said that many electrical papers had recently paid attention to the subject and he therefore tried to visualise the requirements of an audience of electrical engineers. He mentioned the various types of men, including many engineers, who sought his help in making their speeches more effective. Some were chairmen or directors of companies; some were executives who had to lecture their staffs on salesmanship; some, perhaps, were employés desirous of bettering their position, who, though possessing the necessary technical knowledge, knew nothing of the art of effective speech.

As students and graduates of the Institution his audience had a great opportunity to practise their public speaking, either by giving a paper themselves or by taking part in a discussion. As they had to give thought and preparation to their paper it was a pity when such labour was wasted by lack of attention to delivery of the paper.

Other men were self-conscious about their own powers of conversation. They had a feeling that their business associates underestimated their capabilities because of their self-consciousness or self-effacement, with depressing results. Yet, again, others going to the firm's annual dinner and well knowing that a neat little speech would be very acceptable would, if asked, always suggest that someone else be asked to make the speech.

A man must know the sound and possibilities of his own voice and must learn his business. He might have plenty of ideas, but if he wished to hold his audience, he must have learned why an elocution teacher talks about articulation, modulation, inflection, emphasis and the use of pause. A little careful reading aloud would be a great help.

Mr. Duxbury then dealt with the more "mental" side of public speaking. A large vocabulary was not necessary, but a thorough knowledge, both as to pronunciation and definition, was essential if the speaker were to enjoy that ease and fluency which a sound active vocabulary could give. The would-be speaker must have something to say. Mr. Duxbury showed



Rated-current Selector.

Special alloy thermal release (see article, "Protection for Motors," on previous page)

Effective Speech

Rural Supply Economics

that everybody had a tremendous store of knowledge if only the association of ideas were used, brought back to conscious memory, and so made presentable and effective by the process of classification. He showed further how to expand that knowledge by reference books, judicious reading, and a miscellaneous collection of phrases, stories, illustrations and newspaper cuttings.

When the material had been gathered the composition of the speech was simple. He gave practical and common-sense hints on this vital part of a speaker's work and finally he emphasised the need for rehearsal. After a thorough rehearsal it should be easy to pick out the main points of the speech and use them in a condensed form as notes. A good idea was to write out "telegram" notes so that if the speaker's mind went entirely blank, his notes, even if read directly from the page, would make sense. Attention to such detai s wo ld enable the speaker to concentrate fully on the delivery of his subject.

Mr. Duxbury congratulated the Institution upon the acoustic properties of their hall. He demonstrated with varying volume of tone how it was possible for a speaker to use little more than a whisper and still be heard quite clearly. He ventured to put forward the opinion, however, that if audiences found difficulty in hearing the fault might lie with the articulation and delivery of the speaker, and not with the acoustic properties of the hall.

Rural Electrification

AT a meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 2nd, the paper on "Rural Electrification" (dealt with in our last issue) was read by Mr. J. S. Pickles (electrical engineer to the Dumfriesshire County Council). Sir George Lee (President) was in the chair.

In opening the discussion, Mr. J. M. Kennedy mentioned that Mr. John Robson originated the scheme and Mr. C. R. Westlake was in charge for a few years until he went to Northern Ireland. Afterwards Mr. Pickles brought the scheme to fruition and it was a pleasure to know that all three who had been associated with it were present that evening. His own connection was of a "godfatherly" nature because he had to arrange the bulk supply in the early stages. This particular scheme was an entirely rural one for it did not even include the town of Dumfries, and Mr. Robson at the very beginning said that everyone who was at all within practical limits should be offered a supply throughout the whole of the county, on equal terms without any contribution towards service cables or guarantees of any kind. This, of course, meant keeping the cost as low as possible and it would seem that the limit had been reached in that respect. The surface distribution system had been most useful in the scheme and it had also been very useful in Northern Ireland.

Mr. J. S. Pickles

The capital cost per consumer in the author's scheme was £49, as compared with an average of £42 for the whole of the country, but as the author's figure was rapidly falling it seemed that it would not be long before he reached the average figure. On the revenue side it was important to remember that probably 75 to 80 per cent. of potential consumers in rural areas were earning £4 per week or less and they were the backbone of the business. The lines were erected and supply was available before the canvassing started. Many undertakings had canvassed rural areas before any supply was available and then seemed surprised that the inhabitants would not commit themselves to take a supply.

After mentioning the standardisation of tariffs, Mr. Kennedy said that the author showed that undertakings need not be afraid of cooker development because even if it produced another peak, it produced it at another time and added greatly to the load factor.

Mr. C. R. Westlake said that manufacturers had assisted considerably in the development of rural electrification by the

amount of research they had carried out into such matters as the provision of cheap isolators, cheap outdoor switchgear and overhead lines. It was not a wise thing to have too many local offices as these only increased management costs without any great corresponding advantage.

Mr. J. Robson (Clerk, Dumfriesshire C.C.) said that most electrical engineers lived in a perpetual dread of a deficiency on their undertaking, but he had never had that fear and "did not care a hoot" if a deficiency occurred to-morrow because he held the view that just as water was a necessity and the consumer in every case did not pay his full share of the cost of the supply, so electricity was equally a necessity and should be treated in the same way.

Lt.-Col. Waley-Cohen recalled that he had addressed a meeting of the leading officials of the Ministry of Transport and the Electricity Commissioners on rural electrification twelve years ago as a result of which the Rural Conference came into being, and the specification for overhead lines was so altered as to reduce the cost by 30 per cent. Since that time the advance in rural electricity supply had gone beyond anything that even the most sanguine had hoped for or dared to prophesy. He deprecated too hard and fast a line being drawn between rural areas, semi-rural areas and semi-industrial areas because in England they ran into one another at almost every point. A running rate of ¾d. or 1d. was of immense value and a single meter for the farm and house was an advantage.

Mr. F. E. Rowland said that electric sterilising in self-contained chests could be employed effectively in small and medium installations at about ¾d. per kWh. At this figure it compared favourably in running costs with fuel firing and at ½d. per kWh it showed a saving. He strongly advocated one tariff and one meter for all uses of electricity, Mr. Rowland spoke of the manner in which electric drive for threshing had become quite general in Scotland whereas in England it had not been employed very extensively. Tests carried out at Rothamsted showed that electricity compared favourably economically with the tractor up to 1.85d. per kWh. Similar tests for grinding showed that electricity at 1.36d. per kWh compared satisfactorily with a Diesel engine. No reference was made in the paper to pumping which, however, was an important basic load. Mention was also made of the advantage of raising steam for farm purposes by means of electricity. Electric ploughing experiments in New Zealand by Mr. H. G. Kemp, engineer to the Ashburton Electric Power Board were referred to, for which second-hand ordinary tractors were used, the engines being replaced by 20-h.p. pipe-ventilated squirrel-cage motors. These showed that electricity at 1d. could compete with Diesel tractors with fuel oil at 6d. per gallon, whilst at 2d. per kWh it would compete with paraffin at 1s. 1d. per gallon. Mr. Rowlands also referred to the possibilities of electricity in grass drying.

Mr. R. A. Thwaites said the author's area had many advantages over that of the North Wales Company in whose area of 4,000 square miles there were some 20 small local authorities who obtained their energy in bulk and were able to distribute it at low rates. From experience he supported the author's view that the flat rate should be kept high otherwise the whole balance of tariffs was upset. He was surprised that no reference was made in the paper to rating which was a real bugbear of rural distribution. The North Wales Company paid rates in some 300 parishes. The unfortunate supply undertaking although making a loss for several years had to pay rates immediately the new lines were put into commission. Mr. Thwaites also expressed the view that it was time street lighting was taken out of the hands of parish councils and after remarking that the average load factor in farms was 2 per cent.—mostly daylight load—said that in his area there were three grass-drying equipments, only one of which had been operating for a full season, but it had taken 19,500 kWh, proving it to be a very valuable load.

Mr. H. W. Grimmitt, remarking that care should be taken before making comparisons between various rural electrification schemes owing to the differences in conditions, said there was an area of about 1,000 square miles in the Midlands in which every parish down to a population of 50 had a supply. This area contained a large tract of Derbyshire which was comparable with Dumfries, although on a smaller scale. After commenting on the disappointingly low revenue from farms, which was about £10 per annum four years ago and had now reached £14 or £15, Mr. Grimmitt criticised the Ministry of Agriculture figure of 450,000 farms in this country of which it was said only 25,000 were connected to the supply. Actually many of these so-called "farms" were only small holdings and ought not to be included. He then pointed out that no reference was made in the paper to wayleaves, which could increase the cost very considerably and might amount to as much as £100 per mile of mains. In conclusion the speaker said that the recently reduced factors of safety of lines had not reduced their reliability.

Mr. J. I. Bernard spoke of the necessity for supplying cookers free; 80 per cent. of gas cookers in Scotland were put in free. He also criticised the Ministry of Agriculture figures saying that if the small holdings were eliminated, it would probably be found that 20 per cent. of farms were taking a supply of electricity.

The author, in replying, said that in his area there were ten consumers per mile of main whereas the average for the whole country was 62. He had been told that in America the figure budgeted for was four consumers per mile of main. So far as isolated farms were concerned he had given a free service for a distance of two miles and it had proved worth while. Diesel engines on the farm could not possibly compete with electricity at 1d. per kWh and, of course, ¾d. per kWh made the position better. Not a single Diesel oil engine would go into a Dumfriesshire farm—indeed, 300 had already come out. On the question of rates, he said the reason why they did not appear to be very heavy was that there was a lag in the application of rates and the full effect would be felt in two or three years time. Actually, owing to the method of assessment in Scotland, the rates were probably heavier than in England. He had been able to put up 520 miles of h.v. line at very low wayleave payments and 200 miles of l.v. line without paying any wayleave rentals at all.

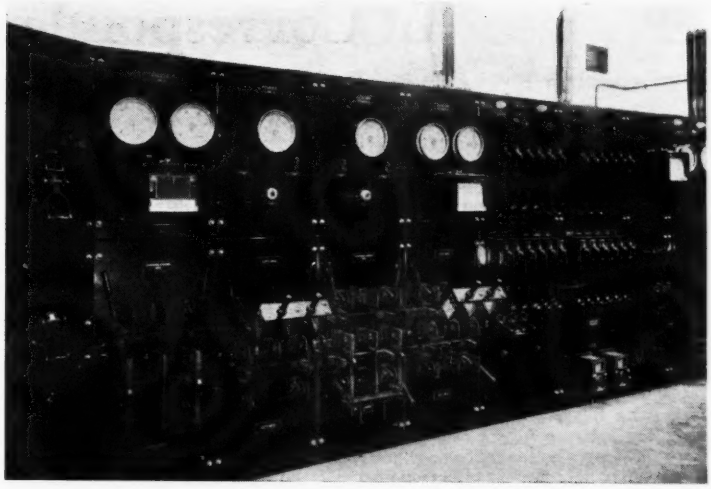
The Ljungström Turbine.—Replying to points raised during the discussion that followed his lecture (reported by us last week) to the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION, Mr. P. J. Wakefield said that designs for radial-flow turbines dated back to the time of James Watt, who had patented a machine of this type. The bearings of the Brush-Ljungström turbine were not insulated, but rotors had been earthed by means of carbon brushes. The Michell thrusts on the Brighton unit and on a 50,000-kW set were on the middle bearings in order to minimise the effect of rotor expansion which might cause an overlap of the blades. That could be calculated fairly well, the final position being determined by running at different axial positions. It would be easier to do so with the Michell thrust at the end, and the central position might not be adopted in all large machines. Mr. W. N. C. Clinch (borough electrical engineer, Brighton) said that spot tests on the Brush set at Brighton showed, under guarantee conditions, a steam consumption of 8.4 lb. per kWh during cold weather. Mr. F. J. Cowling referred to the construction by Parsons of single-rotation radial-flow turbines with both inward and outward flow, mentioning that double-rotation machines had been unsuccessfully used by Robert Wilson in 1848. Favourable comment on the ability of the Ljungström turbine to be run up quickly was supplied by Mr. L. M. Jockel, in which he was supported by Mr. F. D. Napier from his experience with the first set of this type to be installed in this country, which was at the Willesden generating station.

I.E.E. South Midland Centre

SPEAKING at the annual dinner in Birmingham on November 26th of the South Midland Centre of the Institution of Electrical Engineers, over which Mr. H. Hooper presided, Sir Percival Bower deprecated the view that trading undertakings existed for the purpose of relieving rates. The first consideration must be the consumers, and during the past six years there had been tariff reductions in Birmingham amounting to £1,200,000. Last year the undertaking had supplied within its own area 780 million kWh and to other parts 150 million kWh. Last year an intensive campaign in the domestic field had resulted in the installation of 8,000 electric water-heaters in working-class houses and of 526 new cookers. The heating of the new Birmingham Civic Centre would provide 1,500 kW of night load on the heat storage principle. The new airport at Elmdon would also be heated in a similar manner. Sir Frederick Marquis hoped that the industry would always have enough private competition to ensure a spirit of enterprise to bring down costs and increase the range of people benefiting from its working. He hoped, above all, that those engaged in the production of apparatus needed to convey electricity or to use it would not establish rings so tightly that only a very small number of people could live by the industry. The person with brains and capacity should be allowed a proper chance of getting on. Sir George Lee (President, I.E.E.) announced that a new telephone cable had been laid between London and Birmingham and was being carried on into Scotland, Birmingham being the first stop. This cable provided for a large number of wireless or carrier frequencies and he hoped that 400 conversations on one physical circuit would be obtained and that television would be taken by it to the North. The amplifying power amounted to a total of 10^{80}, and there was an amplifier every ten miles. He appealed for funds for the Institution Benevolent Fund, saying that out of 17,000 members only 5,200 subscribed and funds this year were short of demand. Sir Cyril Hurcomb (deputy-chairman, Electricity Commission), proposing the toast of "The Institution of Electrical Engineers," said that in the past ten years the consumption of electricity had been trebled, but under 60 per cent. of existing premises were connected.

An Up-to-date Printing Works

Precautions against electrical failures



A part of the main board in the south switchroom [*Elec. Rev. photo.*

SO largely does the production of a newspaper to-day depend on electricity that it is essential that every precaution should be taken to guard against any possibility of failures. For the new printing works which has just been completed for *The Times* in St. Andrew's Hill, E.C.4, no fewer than five separate services (three-wire d.c.) are taken from the Charing Cross Electricity Supply Co., Ltd., and the City of London Electric Lighting Co., Ltd., into two main switchrooms, either of which can handle the whole supply in an emergency.

Normally two services from each of the supply companies are capable of dealing with the load, provision being made to supply 1,600 kW (400 kW each service). Should, however, all these four services (which enter from the Queen Victoria Street direction) be interrupted, the fifth service giving 200 kW and brought in by an entirely different route can be called into use.

The internal loads are divided into seven sections, five for power and two for lighting, each controlled by its own sectional switchboard. These sectional switchboards are combined together to form two main switchboards, each approximately 40 ft. long by 7 ft. high and housed one in the south room and one in the north. These boards, which have been constructed by J. H. Holmes & Co., Ltd., to the design of the electrical contractors, Rashleigh, Phipps & Co., Ltd., are of very neat appearance, the heavy control gear being mounted on "Sindanyo" panels. Supplies to quarter sections of the presses are controlled by 1,000-A double-pole circuit-breakers with h.r.c. Reyrolle fuses. To permit change-over from any one service to another to be rapidly achieved without risk of interlocking of supply mains, large change-over main switches of special design have been provided with mechanical interlocking devices.

A valuable innovation in place of the old hand operation is the fitting of the two lighting section boards with automatic change-over switches (Watford Electric & Mfg. Co.) in case of the failure of one source of supply. These switches automatically resume their original position on the restoration of the supply. Coloured lights show which services are being taken, while Everett Edgcumbe instruments enable the various loads to be correctly calculated.

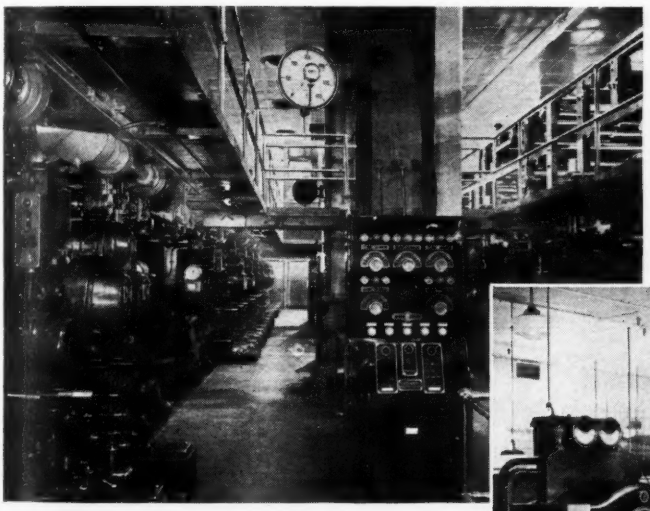
To provide these various change-over facilities it has been necessary to install twenty 0.5-in. single-core, lead-covered and steel-armoured cables from one switchroom to the other. The total length of these cables is about 2,000 yards and the weight 16 tons. Accessibility to the cables is assured by running them in neat steel troughs suspended from the ceiling of the reel store below the foundry. The 30-, 60- and 100-A sub-main fuse boards at various points on the building are of English Electric construction, 15-A Kartret local fuses being used. To facilitate maintenance, every lighting point and motor is marked with its corresponding fuse number.

Throughout the building 285 electric motors, ranging from $\frac{1}{6}$ to 40 h.p. and totalling 2,200 h.p., are employed. Of these, sixteen 40-h.p. motors (Holmes) are required to drive the new 30-unit "Superspeed" rotary press plant (R. Hoe & Co.). Each unit of this machine prints two sections of eight pages each in one revolution of the cylinders and each of the nine folders is capable of producing 40,000 copies of *The Times* an hour.

Opposite every folder delivery is a master control desk with push buttons covering each press combination and local push button control is also provided for the various sections. Situated in a gallery overlooking the press room, the main control board for the presses is 50 ft. in length and incorporates approximately 7,000 electrical contacts to give the necessary control. Any fault can be localised and isolated in a few minutes. An arrangement of the cabling and links permits the controls from each line of presses to be quickly changed over from one switchboard to the other.

To enable the five-mile reels of paper weighing 15 cwt. to be fed into the presses without stopping, three-arm Witton James automatic reel stands driven by 1-h.p. motors are employed, a Yale electric hoist assisting the manœuvring of the reels into the stands. A Jensen adjustable platform avoids damage to the lift (Waygood-Otis) when unloading the reels from the lorries.

In the composing room the unit electric drive is conspicuous for operating the lino-



Left: Part of one line of presses with master control desk for the Holmes unit drive. Below: Some of the "Gigant" electrically heated presses for producing papier mâché matrices [*Elec. Rev. photos.*

type and monotype machines, both of which incorporate thermostatically controlled electric melting pots. Six S.A.P. "Gigant" electrically heated presses for producing the papier mâché

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Street Lighting Report

In my article on "Street Lighting" published in the ELECTRICAL REVIEW of November 20th I mentioned that the Ministry of Transport Committee's recommendations regarding power of light sources for traffic routes could be met by using 250-W discharge lamps at 150 ft. spacing, assuming that at least 60 per cent. of the light from the lamps was emitted from the lanterns employed. It has been pointed out to me that the 150-W sodium lamp, giving initially about 9,600 lumens, also comes within the range given in the Committee's Report, and this lamp should therefore have been included with those mentioned in my article.

It should, of course, be noted that (as mentioned in the article) the Report refers to average lumens throughout the life of the light source and, so far as I am aware, no agreed figures of lumen maintenance have yet been published for discharge lamps. In these circumstances it is not possible to do more than make a reasonable guess, but it would appear likely that with the 60 per cent. lantern efficiency both the 250-W mercury and the 150-W sodium lamps come somewhat near the lower end of the Committee's range when used at 150 ft. spacing, and that therefore the rather closer spacing of 120 ft. recommended by the Committee "where economically practicable" should be aimed at if these ratings of lamps are employed. JOHN W. T. WALSH.

Teddington, *December 6th.*

E.D.A.'s Christmas Advertising

During the past week in the daily Press, women's periodicals, &c., numerous advertisements have appeared depicting electrical appliances as Christmas presents as suggested by the British Electrical Development Association. To my disgust ridiculous prices are quoted: for instance, irons from 12s. 6d., fires from 25s., reading lamps from 2 guineas, coffee percolators from 45s. If these prices were halved they would be about right, for anyone in the trade knows that perfectly good irons—British made and guaranteed for five years—sell at 5s. each, and that reflector type fires (as illustrated by E.D.A.) can be purchased for as low as 16s. 6d.

I suggest that E.D.A.s publicity department should wake up and get to know things. E. SALMON.

Ewell, *December 4th.*

Earth Leakage Trips

I thank Mr. Gilbert for conceding my point. I cannot concede his in return, however, and a detailed explanation why and an explanation of the effects of fault resistance will appear elsewhere. The information will be available to Mr. Gilbert. H. G. TAYLOR.

London, W.C.2, *December 6th.*

The correspondence on this subject, which now appears to have settled down to an exchange between Mr. Taylor and Mr. Gilbert, is valuable as showing how opinions can differ on what, on the surface, should be an elementary problem—I, for my own part, am particularly aware that it is not.

For instance, if 65 V across the trip is required to operate it, the voltage between a point on the exposed and live metalwork and some point on the ground outside and earthing device will be appreciably more than this, *i.e.*, assuming an operating current of 30 mA the rise in the 750-ohm earthing resistance is 22.5 V, hence the total "shocking" pressure to earth is 87.5 V. Again, the point at which the "shockee" may make contact with both metal-work and ground may be at an appreciable distance from the earthing resistance and the contact resistance conditions to ground may be appreciably altered. For example, even in dry weather a steel barn structure with concrete footings will generally show a comparatively low resistance as compared with, say, a driven pipe used as the main resistance.

In adding my plea to Mr. Taylor's for operating pressures of not more than 30 V or so I recognise that some time ago I expressed to Mr. Gilbert the opposite belief. I have had, however, more recent occasion to consider the whole matter rather fully and I must therefore vote on the low-pressure side. C. A. CAMERON BROWN.

Oxford, *December 4th.*

The Resistivity of Water

The test figures provided by Col. W. A. Vignoles, in his letter in your issue of December 3rd, indicate that distilled water cannot be considered as pure water because the conductivity figure of 6 is higher than the conductivity figures given for the condensate at a number of power stations. If "the conductivity of water containing any electrolytic substance in solution is due almost entirely to the dissolved substance," it is difficult to understand why the condensate of one London power station should have a conductivity of one-sixth that of distilled water supplied by various chemists. I do not doubt the accuracy of the figures Col. Vignoles provides, but I note that condensate and boiler feed are bracketed for the conductivity figures 1 to 5, and in the London power station example, where the condensate figure of 1 unit was ascertained, the tests were continuous.

In your issue of October 22nd I described in a letter on "Earth Resistance and Potential Trips" an experiment I made with water containing impurities, such as lime, the effect of the test current being to decrease the conductivity of the water without removing impurity from the sample. This particular experiment concerned the conductivity of soil, &c., in the circuit of a leakage trip, in which it was indicated that a small leakage current could virtually isolate the trip by creating a great increase in resistance in the soil circuit by reason of the action of the current on the impurities in the soil moisture.

I have obtained the same increase in resistance effect when using gelatine in solution instead of cotton wool as a substitute for vegetable fibre in soil. The resistance was first lowered, but gradually built up to an infinity value. Yet both the lime and gelatine were still present in solution.

Perhaps Col. Vignoles may know if any of the power stations were using chemicals for the prevention of scale formation. In some cases colloids might be present in the boiler feed when the passage of the test current would have the same resistance-creating effect as it has when gelatine is employed under the conditions of my experiment. This might possibly explain why condensate and boiler feed has an apparently lower conductivity than distilled water, contrary to expectations. A. G. BULLEN.

Liverpool, *December 6th.*

An Up-to-date Printing Works (*Concluded from previous page*)

matrices are driven by 6-h.p. Witton James motors and are loaded at 12 kW each. The plates moulded in these matrices are cut, shaved, trimmed, finished, &c., by electrical means before being fitted to the rollers.

Bundles of the printed and folded papers are automatically counted by an ingenious device (Watford Electric and Mfg. Co.) as they pass up to the electrically driven conveyors in the publishing room. Here a Julius Sax indicator (operated at 14 V through a motor generator) simplifies the distribution of address labels to the various packers. Among other inter-departmental signalling systems installed is one in the foundry for communication with the machine room. A Synchronome clock system is operated from the master clock in the old building.

About a thousand lighting points are provided in the building and special care has been taken to install appropriate fittings. Benjamin elliptical reflectors incorporating 500-W lamps are used with marked success in the machine room and foundry where they are fixed high up on the stanchions and side walls. Each of these fittings, like the "Typerlite" units on the linotype machines, &c., is connected to a wall socket in order to allow rapid replacement. The lighting below the decks of the presses is carried out by means of "Wigan" prismatic fittings fixed horizontally and giving a 180 deg. angle of distribution.

Nowhere is adequate lighting so important as in the composing room. Here reflector fittings specially constructed by the Euston Mfg. Co. run just below eye-level the whole length of the stones and randoms, a "tunnel effect" being avoided by the addition of numerous ceiling fittings. Following the practice throughout the building alternate lights are on different circuits. B. N. Bray & Co.'s contactors are fitted to operate the Hunter Penrose camera arcs in the process rooms. The decorative fittings on the staircases, &c., were supplied by Troughton & Young, Ltd.

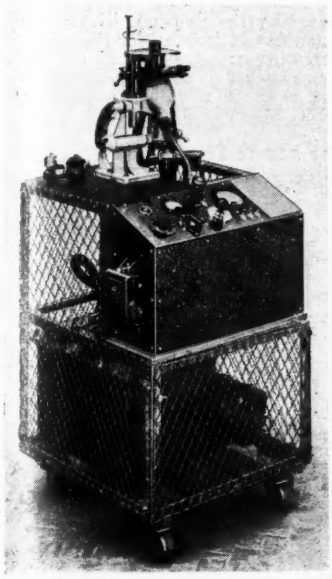
For the heating and air-conditioning system carried out by the Crittall Mfg. Co., Ltd., Holmes motors with Electrical Apparatus Co.'s starters are used.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Mobile X-Ray Outfit

The mobile "Dexrae" outfit marketed by ADAM HILGER, LTD., 98, King's Road, Camden Road, London, N.W.1, is designed for X-ray metallurgical studies and the examination of refractories, slags, &c., under industrial conditions. All the equipment is mounted on a trolley with a control panel at the front.



The "Dexrae" outfit

The X-ray tube is of the demountable type, so making it possible to incorporate four targets within the one body and permitting the examination of a very wide range of specimens.

In addition to the camera equipment, which is bolted to a boss cast on the X-ray tube, a metallurgical microscope is offered as an accessory for the optical examination of specimens. The tube and oil-diffusion pump (which is backed by a rotary oil pump) are water cooled in conjunction with a safety trip that interrupts the main circuit in the event of water supply failure.

The tube can be maintained in any position from the vertical to the horizontal by clamping it to a metal supporting arc. This tilting enables large specimens to be examined *in situ*. When in the horizontal position the camera overhangs the back of the trolley, while smaller specimens rest on a table designed to bear a weight of 50 lb. Since it is made almost wholly of metal, the body of the X-ray tube is maintained at earth potential and fed from the transformer by means of a suitably insulated cable, so rendering it shockproof while the thickness of metal makes it also ray-proof.

Cooker Control Switches

The modern kitchen with its compact layout provides no room for bulky switchgear and a cooker control unit recently introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, measures only 8¼ in. by 5 in. by 3⅜ in. projection, and the pressed steel case has a pleasing appearance. A front plate of nickelled steel may be used with a grey stove-enamelled box, or the whole unit may be stove-enamelled in mottled grey (illus.). The case is equally suitable for surface mounting or for semi-recessing into the wall according to the situation in which it is required.

The unit, which is designed for use on circuits up to 250 V, consists of a 30-A d.p. main switch together with a 5-A or 15-A sub-circuit consisting of a three-pin socket outlet controlled by another d.p. switch. The sub-circuit is normally connected to the neutral side of the main switch, but by changing over two connections it can be transferred to the live side if required. Poth switches are front operated and are of the d.p. q.m. and b. type. The main switch is fitted with a sliding indicator showing whether the switch is in the "On" or "Off" position, and the unit is available with a pilot lampholder and amber bull's-eye, giving luminous indication where required. The socket outlet is fitted with a side entry plug and is protected (with the pilot lamp circuit, if fitted) by a s.p. fuse of the rewirable cartridge type in a bakelite holder.

The interior is mounted on a hinged chassis, which greatly simplifies wiring and from which all live parts are efficiently insulated. The sub-circuit fuse and pilot lamp can be replaced without removing the lid. Cable inlets are provided by three 1-in. knock-outs, one at the top and two at the bottom of the case, and the whole unit complies with B.S.S. No. 438 (1936).

Left: The G.E.C. cooker control unit showing the hinged chassis. Below: The Jackson 90J cooker mounted on a stand

A Novel Accumulator

An accumulator which can be completely dismantled in a few moments for cleaning, inspection or repair is now available from SIMPLAK BATTERIES, LTD., British Industries House, Marble Arch, London, W.1. The lead-coated metal clip which secures the lid and provides sockets for the carrying handle also serves as a tool for removing the various components.

Both the container and lid are of moulded material and a glass window is provided in the former for inspecting the acid level. The lid, which bears a nameplate for identification, is sealed by a specially prepared acid-resisting plastic compound. It is possible to purchase any part separately, a valuable economy feature in view of the fact that the life of the negative plates is often less than that of the positive.

A Simplak accumulator fitted with a searchlight designed for fire brigades

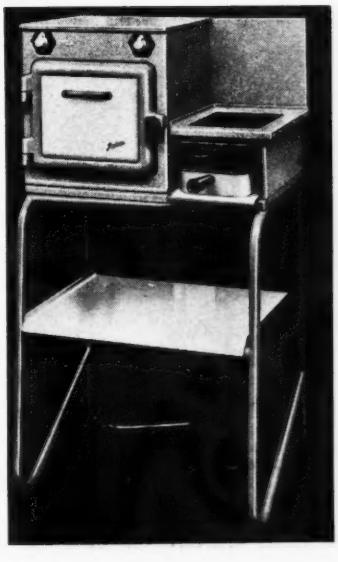
For use with the accumulators a range of portable lamps suitable for all sorts of purposes is available. They are made to fit readily directly on to the top of the accumulator, the direction of the beam being adjustable. Special tyres are produced to meet the requirements of garages, fire brigades, hospitals and farms.

A Table-top Electric Cooker

The latest domestic cooker of the JACKSON STOVE CO., LTD., 143, Sloane Street, London, S.W.1, is the 90J table model designed especially for mounting on the kitchen table or on a refrigerator, thus saving space.

The oven and boiler-griller are mounted side by side. An oven loading of 1,200 W and controlled by a rotary switch above the door, a similar switch on the right hand side controlling the 2,000-W 9 in. by 7½ in. boiler-griller. The actual oven cooking space is 10 in. by 12½ in. by 11½ in., which is sufficient for 6 lb. beef with Yorkshire pudding and baked potatoes, or a 12-lb. turkey.

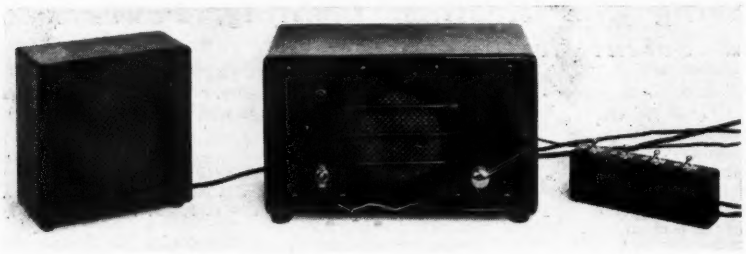
"Marblon" mottled vitreous enamel is the finish employed for the hob, oven interior, front frame, sides and hob splashplate, the oven door panel being white enamelled. For positions where space is available a special tubular stand is made.



A Loud-speaking Telephone Set

The loud-speaking telephone for intercommunication in offices, factories, restaurants, hospitals, &c., which is distributed in London by the OFFICE COMMUNICATIONS CO.,

Buchanan House, 24, Holborn, E.C.1, is manufactured by GAMBRELL RADIO COMMUNICATIONS, LTD., 3, St. James's Square,



The Gambrell intercommunication equipment

London, S.W.1. It is mains operated and both a.c. and d.c. models are obtainable. The master instrument is a three-valve transmitter-receiver combination (11¼ in. by 6¾ in. by 6½ in.) which stands on the desk. On one side is a switch and miniature pilot lamp for keeping the amplifying valves warm and ready for instant conversation. On the opposite side is a small lever which must be kept pressed down while speaking and then quickly released, when it springs back to the central listening position. When pushed upwards it acts as an "off" switch.

Speech is reproduced at normal voice level several feet away from the instrument and the volume can be adjusted by turning a brass screw which is easily accessible through a hole in the bottom of the cabinet. The extension speakers (6¾ in. by 6¾ in. by 3⅜in.) are of "Celestion" make, and any number may be fitted, perhaps several floors away from the main instrument; ordinary bell wiring suffices.

A small control panel, with one switch for each extension speaker, is supplied for mounting on the side of a desk or table leg. These instruments are built into well made walnut cases of superior appearance and their use avoids the delay of dialling or asking for telephone numbers.

A Small Domestic Cooker

Specially designed for use in households of up to four persons and for installation in flats where space is necessarily limited, the "Modernette" cooker of BRITISH NATIONAL ELECTRICS, LTD., Newarthill, Motherwell, Lanarkshire, has overall dimensions of 18½ in. wide by 14¼ in. deep by 19½ in. high.

Heating is by means of a 9 in. by 7 in. 1¾ kW griller-boiler and a separate ¾ kW oven element. The tubular radiant type griller-boiler is controlled by a three-heat switch, a heavy-gauge aluminium reflector plate being used.

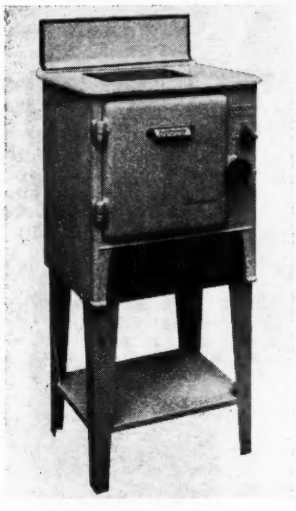
Two grid shelves and roasting tin are included in the oven equipment and the interior and all sheet metal portions are of heavy gauge and vitreous enamelled. The separate oven element, which is controlled by an "on-off" switch, is situated at the bottom, and serves also to keep the space below the oven sufficiently warm for dish warming. Incidentally this space may be utilised to house a 1-kW reflector type fire fitted with a rod element; when the oven is in use this is covered by a drop down door, when the door is opened the fire is automatically switched on and the cooker elements cut off, thus reducing the maximum demand.

The heat-insulated oven door is made of cast iron and fitted with a thermometer and bakelite door handle; cast iron is also employed for the frame, the finish being mottled grey vitreous enamel. The oven cooking space is 11 in. wide by 12 in. deep by 12 in. high. A stand is available to bring the cooker to a convenient height.

An interesting heating chart has been prepared by the company, which shows that it takes 14 minutes for the centre of the oven to reach 450 deg. F., if the supply is then switched off the temperatures after 10, 20, 30 and 40 minutes are respectively 330, 265, 215 and 180 deg. F.

Wiring for Severe Conditions

An acid and fume resisting cable (Type FDJL) has been introduced by ASEA ELECTRIC, LTD., Fulbourne Road, Walthamstow, E.17, as a component of its wiring system for factories. The tinned soft-drawn copper conductors are insulated with distinctively coloured v.i.r. and laid up and sheathed with tough compound rubber, over which there is a lead sheath. Protection against corrosion is provided by a wrapping of bitumenised paper and against rough usage by two layers of steel-tape armour rendered acid-proof by lead coating and surrounded by further bitumenised papers. The whole is cotton-braided and red-lead compounded.

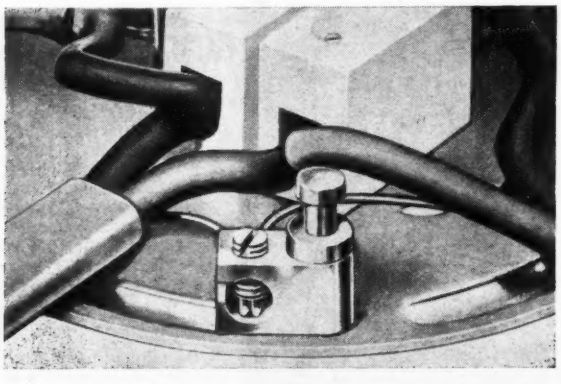


The "Modernette" cooker

This system dispenses with conduit, screwed sockets, beads, inspection tees and elbows. Cast-iron junction and ceiling boxes with varied outlets are available with watertight glands and earthing cones. Watertight glands can also be supplied separately with B.S.S. conduit thread and locknuts for cable entry into any standard box, switch or distribution board. The cable can be bent round obstructions and clipped and saddled in position, while alterations can be effected by cutting it and inserting junction boxes.

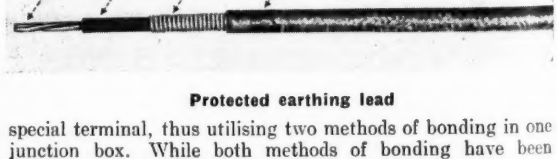
New Earthing Facilities

TWO new features have recently been introduced in connection with the Callender wiring system. The design of the C.B. junction boxes and bonding accessories (intended for use with lead alloy sheathed wiring system cable without earth continuity conductors) has been amended, and now incorporates as standard a dual bonding terminal. This allows lead alloy sheathed cables, with or without earth continuity conductors, to be used with the one range of standard junction boxes. The first of the accompanying pictures shows how



The dual bonding terminal, a new feature in the Callender wiring system

the continuity conductors are connected so that when a wiring installation has to provide the utmost safety under conditions calling for extra precautions, cables with earth continuity conductors can be used and dual bonding carried out. The lead alloy sheathed cables are bonded to the junction boxes in the usual manner by mechanical contact with the lead sheath, and the continuity conductors inside the sheath are bonded to the special terminal, thus utilising two methods of bonding in one junction box. While both methods of bonding have been proved individually over a long period, occasions do arise when special precautions are considered necessary, and therefore this extra facility of dual bonding is now offered.



Protected earthing lead

The second innovation is the protected earthing lead complying with I.E.E. Regulation No. 1007 (A), which states that "Every conductor used as an earthing lead . . . shall be protected where liable to mechanical damage and, where necessary, also protected against corrosion." The conductor consists of tinned copper wires, covered with a strong closely woven cotton braid impregnated with preservative compound, then close spirally armoured with galvanised iron wire, and again braided with strong closely woven cotton impregnated with preservative compound, coloured light brown. It is supplied in single conductor form in 7/0.029 in., 7/0.036 in., and 7/0.044 in. sizes; the standard packing is in 100 yd. lengths on reels.

Improvements in Argentina

A highly competitive market

The Commercial Secretary in Buenos Aires again stresses the need for British exporters to quote lower prices

PROSPERITY in Argentina has at last materialised, states Mr. E. R. Lingeman, Commercial Secretary, Buenos Aires, in a report on economic and commercial conditions in the Republic prepared for the Department of Overseas Trade (Stationery Office, 4s.). The trade figures for the opening months of 1936 were far from encouraging, and by the end of the first six months the value of exports had declined by 14.9 per cent., whilst that of imports was 3.7 per cent. lower, a positive trade balance of $184.4 million pesos, as compared with $289.8 million pesos for the first half of 1935. In spite of this, the Central Bank, following a drought in North America and a rise in world market prices, was induced, in anticipation of better times, to offer exchange in the free market, thus accelerating a reaction which was bound to take place of its own accord. In consequence the surplus for the whole of 1936 rose by 36.6 per cent., reaching $539 million pesos, the highest recorded since 1919. The general increase in the prices of Argentina's primary exports, it is observed, was mainly responsible for the gratifying result of the year's trading.

Further progress in the generation of electricity was witnessed in 1936, the production reaching 1,872 million kWh, as compared with 1,715 million kWh in 1935. Of the former amount the two companies supplying the Federal capital and neighbouring districts accounted for 1,345.8 million kWh, the distribution of their production in recent years being as follows :—

	Millions of kWh.		
	Private lighting.	Public lighting.	Power and traction.	Total.
1929	270.2	47.6	511.0	828.8
1932	286.7	43.6	672.3	1,022.6
1935	322.2	41.0	883.4	1,246.6
1936	348.5	40.2	957.1	1,345.7

The increasing number of small factories in the neighbourhood of Buenos Aires taking power from the main supply is reflected in the above figures, while the expanding use of electricity for domestic purposes is the outcome of the growth of the urban population and the popularity of electrical appliances.

Radio-telegraphy and Telephony

The agreement between the Argentine Government and the Cia. Transradio Internacional for the formation of a joint company came into force on February 1st this year, the new company being named Telecommunicaciones Internacionales de la Nacion Argentina-Transradio S.A. The company will act for the Government as exclusive agent for all international telegraphic communications, excepting those which are maintained with neighbouring countries, and up to a distance of 1,000 km. by means of radio. Additional radio stations were established during the year for communication between Argentina and a number of other countries.

Telephone services have been rapidly extended in recent years. Numerous modifications and improvements were made in the telephone system of the United River Plate Telephone Co. during the year under review, including the inauguration of 194 new physical circuits and eighteen new carrier circuits; the opening of ten new offices, five of which are automatic; the reconstruction of twenty-three offices, and the extension of the facilities of thirty-six offices.

Broadcasting licences not being necessary for the use of receiving sets, no official statistics are available regarding the number of sets in use in the Republic. It is, however, computed at over one million units, and probably one-half of these are in service at once. In Buenos Aires there are now eighteen stations in operation, and a recently erected State broadcasting unit has now been added to this number. The Municipality is shortly to replace its present station by a more modern installation, and among developments in the provinces the most prominent was the purchase of three wireless stations from the Telefunken concern by the Government of the province of Buenos Aires for its official broadcasting service. There is still ample room for further radio expansion, and it is anticipated that one development will be the establishment of small stations throughout the interior of the Republic for local or spot service only, while the almost prohibitive cost of telephone lines for chain service between the parent station and its links in the interior will be to a great extent overcome by the use of special recording devices. The development of television is being studied, and United States, Dutch, and German companies with interests in the Republic appear to be contemplating the installation of a service. It is to be hoped that United Kingdom systems will also be given an opportunity of proving their worth.

The electrical trade has already benefited from the improved economic situation, and that the United Kingdom has shared in the additional business is shown by a rise in the imports of both machinery and materials from that source of 30 per cent., the most notable progress occurring in telephone and telegraph apparatus, which showed an increase of 50 per cent. Large building sites are being developed, and there is every indication of further building programmes which will necessitate large imports of electrical machinery and apparatus of every description.

Generating Plant Extensions

A number of new generating plants have been installed, and though electricity supply companies have only added to existing plants to a moderate extent, it is thought that further extensions will be made necessary shortly. Most of the machinery put down in the past year was Diesel driven, United Kingdom manufacturers receiving a good proportion of the orders placed. Owing to the extensions of the power distribution system being small, few power transformers were sold, but there was an all-round increase in electrical equipment for existing factories as well as new establishments, and the growing demand for motors and dynamos and accessories is reflected in the import figures, 2,577 tons of such products being imported in 1936, as compared with 1,643 tons in 1935.

Trade in electric wires and cables improved in 1936, the import figures rising from 1.972 tons in 1935 to 2,300 tons. Sales by the United Kingdom, however, were disappointing, and there is no doubt that this was partly due to two local factories, even though wires and cables from these are of an inferior quality, and to competition from Germany and the United States, who appear to be able to quote more attractive prices. Mr. Lingeman says that United Kingdom manufacturers would do well to quote more competitive figures and also to study the requirements of the Argentine market more closely.

Small domestic electrical appliances, such as toasters, irons, kettles, stoves, heaters, and floor polishers continue to be popular, and it is estimated that two-thirds of the demand is supplied by the national industry with an article of poor quality, but low-priced, which attracts local users. The import trade is with the United States and Germany, who offer much cheaper products than their United Kingdom competitors. Trade in electric lamps is characterised by fierce competition from Japan and Russia and by the development of local manufacture by members of the international association. Notwithstanding cut prices, the non-associated companies are losing ground and are likely to continue to do so in the face of the growing production of the local industry. In dry cells also imports are likely to be reduced to insignificant quantities when a factory being established in Argentina by an American company is in operation.

Local Assembly of Apparatus

In connection with radio apparatus, a few United Kingdom receivers are being sold, mainly expensive models for which there is a limited market, the main turnover being in table models and, to a lesser degree, in radio-gramophone sets. This trade is now mainly in the hands of the local assemblers, owing to the high duties payable on imported assembled sets, and in consequence there is a large and growing demand for imported parts and accessories obtained chiefly from the United States, Germany, and, until recently, the United Kingdom, which has lost much ground to its American competitors, whose products are from 15 to 20 per cent. cheaper on an equal exchange footing. It is very necessary for United Kingdom exporters to meet local requirements more closely and reduce prices to a competitive level if they expect to participate to any important extent in this expanding trade.

The climate of Argentina is of a nature to stimulate a widespread demand for domestic refrigerators, and the outlook for this trade is very bright. The bulk of the automatic refrigerators sold in the Republic consists of imported parts built into locally made cabinets under the protection of a high Customs tariff. The importance of the trade in imported parts can be gauged from the fact that 232,000 kg. entered the country in 1936. The total number of units assembled locally with imported parts was about 5,000. Figures showing the trend of the principal electrical imports into Argentina since 1933 are given in an appendix to the report.

In the Courts

Dry Battery Action Abandoned

Intimation was made in the Court of Session, Edinburgh, on December 3rd of the abandonment of an action, which was down for proof, before Lord Keith, at the instance of Vidor, Ltd., Erith, Kent, against James W. Graham, Perth, for payment of £87 17s. 5d. Plaintiffs averred a contract with the respondent to supply him with 2,000 120-V batteries in blue cartons, with the respondent's name printed on each. The respondent took delivery of 144 batteries and paid for them, but refused to take delivery of the remainder because of complaints from his customers regarding the quality of the batteries, and particularly that they had a very short life. The plaintiffs averred that the price to be paid for 1,856 batteries which the respondent did not take was £363 9s. 4d. and the cost of manufacture of the batteries was £284 4s., the difference being £79 5s. 4d. representing loss of profit, and with the cost of the cartons purchased for the batteries £8 12s. 1d., made up the total of £87 17s. 5d., which was the sum sued for.

The respondent denied the claim and made a counterclaim of £250 for damages, being £120 for loss of profit on the batteries and £130 for injury to his business reputation.

After the pleadings were adjusted and a proof allowed, both parties called for discovery of documents, and subsequently Burndept, Ltd., were substituted as plaintiffs, they being stated to be the manufacturers of the batteries, Vidor, Ltd., being the selling agents. Certain productions made by the plaintiffs were sealed up, because the plaintiffs alleged that they contained trade secrets and must be treated as confidential. The respondent moved the Court to open the sealed packet and make the documents it contained available to the respondent. This motion was resisted by the plaintiffs.

After debate Lord Keith gave judgment allowing eight of the eleven documents in the packet to be produced. Counsel for the plaintiffs thereafter intimated the abandonment of the action, and Lord Keith directed the packet to be resealed and delivered to the plaintiffs. The respondent was awarded his expenses in the case, except the expenses of the counterclaim, which is being withdrawn.

L.A.E.U. Scheme Approved

In the Chancery Division on Monday last Mr. Justice Simonds had before him a petition for the sanction of the Court to a scheme of arrangement for the amalgamation of the Charing Cross Electricity Supply Co., Ltd., the Brompton and Kensington Electricity Supply Co., Ltd., the Chelsea Electricity Supply Co., Ltd., the Kensington and Knightsbridge Electric Lighting Co., Ltd., the St. James's and Pall Mall Electric Light Co., Ltd., and the Westminster Electric Supply Corporation, Ltd., London Associated Electricity Undertakings, Ltd., having already bought over 90 per cent. of the shares of these six companies.

The combined capital of the companies concerned in the merger was £6,892,194. Shareholders representing 90 per cent. of this capital approved of the scheme, the progress of which had been held up for some time in 1935 by an objection which was carried to the Court of Appeal where it was decided that it was permissible. The present issued capital of London Associated Electricity Undertakings was £7,009,558, consisting of £1,405,000 in 4½ per cent. cumulative preference stock, £953,252 in 6 per cent. cumulative preference stock and £4,651,306 in ordinary stock.

Mr. Gordon Brown in support of the petition said that the object of the scheme was to effect a real amalgamation of the undertakings of the six companies in the interest of efficient management and the equalisation of charges in the different areas. Since the London Associated Electricity Undertakings Co. had acquired the shares in the companies concerned they had appointed by agreement a manager of all the concerns in order to co-ordinate the undertakings, but it had been found impossible to reorganise the position satisfactorily until the undertakings had been amalgamated.

The scheme involved the amalgamation of the undertakings by the Charing Cross Co. acquiring the undertakings of the other companies which were to be dissolved. So far as possible in the issued allotment of shares preference shareholders were to be given the same income return as was furnished by the shares they formerly held.

Mr. Justice Simonds, after hearing the details of the scheme, sanctioned it.

Wireless Engineer's Libel Action

In the King's Bench Division on December 1st the action of Williams v. Radio Rentals, Ltd., came before the Lord Chief Justice and a special jury. The plaintiff, Mr. Owen C. Williams, a wireless engineer, of Willesden, brought the action to recover from the defendants, his former employers, damages for alleged libel contained in two letters written by or on behalf of the defendants to A. C. Cossor, Ltd., the plaintiff's present employers.

The plaintiff's case was that when he resigned his position with the defendants in May, 1936, and applied for an appointment as installation engineer for television receivers with Messrs. Cossor the latter wrote to the defendants for references and on November 20th, 1936, defendants replied: "This engineer came into our employ on September 10th, 1934, and was discharged on May 2nd, 1936, because we had no further use for his services. . . . To a certain point this man performed his services sufficiently well to enable us to appoint him to a depôt but we found that after a period of individual responsibility he began to prove unreliable and became eventually so unsatisfactory as to merit dismissal."

The other letter was written by or on behalf of defendants to a Mr. Blackwell of the television sales department of Messrs. Cossor on December 11th, 1936, in which it was stated *inter alia* "During the early part of his (plaintiff's) service he performed his services satisfactorily whilst under supervision at head office but later when placed upon his own responsibility in charge of a depôt we discovered that he had become less reliable and finally were obliged to dispense with his services."

The defendant's main defence to the action was that the letters were written on a privileged occasion and that they had not been guilty of malice.

Lord Reading, for the plaintiff, said that his client was engaged by the defendants in 1934 and eventually given charge of the area around Maidenhead. He covered at least 600 miles in his car every week in obtaining wireless subscribers. There came a time when he applied for a reconsideration of his salary and expenses, whereupon he was ordered back for service at the head office. He regarded that as a lowering of his status and sent in his resignation. Yet the defendants had said that he was dismissed, which was untrue.

The plaintiff having given evidence in support of his case, Mr. P. N. Leathers, development manager of the defendant company, in giving evidence for the defendants, said he wrote the letters complained of as defendant's staff manager. His feelings to the plaintiff were always cordial but he understood that his company was about to dismiss plaintiff and when he wrote the letters in question he wrote them from memory and realised now that his memory had played him false.

His Lordship having held that the occasion on which the letters complained of were written was privileged left the case to go to the jury on the question of whether, in the circumstances, defendants had been actuated by malice. At the conclusion of the summing-up the jury, after a short retirement, returned a verdict for the plaintiff for £350 damages and judgment was accordingly entered for him for that amount with costs.

Claim by Radio Patents Pool

In the Chancery Division on December 2nd Mr. Justice Crossman had before him an important action relating to wireless royalties on a procedure summons taken out by Marconi's Wireless Telegraph Co., Ltd., Electric & Musical Industries, Ltd., Hazelpat, Ltd., Standard Telephones & Cables, Ltd., and the Western Electric Co., Ltd., against Murphy Radio, Ltd.

Mr. Tookey, for the plaintiffs, said that they owned hundreds of patents relating to wireless apparatus, and they had formed a pool for granting licences to radio manufacturers who paid royalties under the licence. Then there was an arrangement for splitting up the royalties among the patent owners. The pool on one side and the Radio Manufacturers' Association on the other had agreed that £120,000 would be a reasonable figure for the pool to get for its licences.

Mr. Lloyd Jacobs, for the defendants, said he did not admit that £120,000 was agreed to as the reasonable figure of royalty from the persons who signed the licences.

Mr. Tookey said the figure in any event was agreed to and the licence provided that if in any year the aggregate of royalties did not amount to £120,000 a proportional surcharge was to be levied on the licensees to make up the deficiency. Under this provision the plaintiffs claimed payment of £2,391 for 1934 and £3,244 for 1935.

The defendants denied that the plaintiffs controlled the basic patents necessary to many of the main features incorporated in modern broadcast apparatus. They also denied that the plaintiffs had any right to the surcharge claimed and counterclaimed to set off against any sum found due from them a sum they alleged to have been an excess payment in 1935.

On the summons the plaintiffs asked for particulars from the defendants of the allegations made in the defence, and the defendants also asked for discovery of the documents relating to the patents controlled by the plaintiffs.

On December 3rd Mr. Tookey admitted that the defendants might be entitled to an order for discovery but not before the particulars which the plaintiffs asked for.

At the conclusion of the arguments His Lordship said that in his opinion the plaintiffs were entitled to the particulars they asked for in the summons and he made an order accordingly.

No Supply for a Bungalow

An action brought by Mr. Frederick Norman, of Chase Cross Road, Romford, against Mr. William Algar, a builder, of Seymer Road, North Street, Romford, came before Mr. Justice Simonds in the Chancery Division of the High Court last week. The action concerned an agreement to buy a bungalow in Romford. Mr. Norman claimed damages for alleged misrepresentation or breach of warranty and the rescission of an agreement of November, 1936. He also claimed the return of a deposit of £25. He alleged that he

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Co-operation

At a recent meeting of the Council of the Electrical Contractors' Association the Director (Mr. L. C. Penwill) reported upon matters arising out of the decision taken at the 1935 National Electrical Convention to form a "National Electrical Co-operative Council." According to the *Electrical Contractor* Mr. Penwill said that at a meeting held subsequently to the Convention a representative of E.D.A. said that part of the reorganisation of that body had visualised the setting up of co-operative committees and that it was considered that there was no necessity for another committee which would involve additional expenses and would only accomplish the same things as the committees set up by E.D.A. The meeting was accordingly adjourned so that E.D.A. could submit its proposals to the National Co-operative Committee at a later date. The report goes on to say:—

"The Co-operative Committee established by the E.D.A. had subsequently met and were asked to confirm that the Committee was sufficient to undertake all that was required; the E.C.A. representatives were not in a position so to do, and eventually the E.D.A. intimated that by their constitution they were unable to deal with many of the difficulties which were being experienced as between supply authorities and electrical contractors; it was, in fact, laid down by the Chairman of the Committee (an E.D.A. representative) that the E.D.A. had no power to go outside general matters of public propaganda, etc. A formal reply had now been received by the Secretary of the National Electrical Co-operating Committee and a meeting of that Committee had been convened."

The electrical demonstration house of the Birmingham Electric Supply Department on the Billesley estate, showing (left) the house floodlighted, and (right) Councillor Mrs. C. C. Garrard performing the opening ceremony

Bakelite Electrical Imports

In the House of Commons on December 7th Mr. Short asked the President of the Board of Trade if he could state the volume of Japanese imports of bakelite electrical accessories during the last eight months, and whether the retail prices of these articles were considerably lower than those of British manufacture. Mr. Stanley said he regretted that he could not supply information as to the volume of imports of bakelite electrical accessories from Japan as accessories of bakelite were not recorded separately from those made of other materials. An application for increased duty on certain electrical accessories had been made to the Import Duties Advisory Committee, who had no doubt taken the question of retail prices into consideration.

An Electrical Demonstration House

The Birmingham Corporation Electric Supply Department has equipped a house on the Billesley estate as an electrical demonstration house, and this was formally opened on November 13th by Councillor Mrs. C. C. Garrard, chairman of the Birmingham and District Branch of the E.A.W. The equipment includes a variety of electrical appliances (most of which are supplied on hire) especially suitable for installation in working-class residences. The house is the third of its kind to be opened during the past twelve months, and is being closed tomorrow (Saturday). Since it was opened special cooking demonstrations have been given on Monday and Friday each week at the Community Hall on the estate. To attract the attention of people on the estate the house has been floodlighted in the evenings.

Works Visit

On December 8th a party of sixty members of the Institution of Electrical Engineers (Transmission Section) visited the works of Steatite & Porcelain Products, Ltd., at Stourport. They were entertained to lunch by the company and afterwards made a tour of the factory, during which they inspected the processes of manufacture of porcelain insulators for high voltage apparatus and transmission lines, and of die-pressed ceramic and refractory insulators for domestic, radio and heating equipment. A demonstration of high-voltage testing was given in the research laboratories.

New B.I. Showrooms

British Insulated Cables, Ltd., has opened a number of showrooms in various parts of the country from time to time, and it has now added to these a new showroom at its factory at Prescot. In the accompanying illustration we show a part of the showroom, showing the effective lay-out of the company's products.

The new showroom at the Prescot factory of British Insulated Cables, Ltd.

A Street Lighting Conference

A conference on street lighting was held at the E.L.M.A. Lighting Service Bureau on November 29th under the chairmanship of Alderman D. Stuart. The first lecture entitled "The New Era in Electric Lighting" was given by Mr. J. N.

In the Courts *(Concluded from previous page)*

was induced to enter into the agreement to buy the bungalow by a representation that a supply of electricity would be available for heating and lighting purposes. No supply was, in fact, available, and Mr. Norman had to leave the bungalow. He suffered loss in his business as a dog-breeder in consequence.

Mr. Algar denied there was any misrepresentation or breach of warranty and contended that Mr. Norman was not entitled to have the agreement rescinded.

Mr. Justice Simonds, after hearing evidence and speeches by counsel, gave judgment in favour of Mr. Norman. He said that he had no doubt that Mr. Algar told Mr. Norman that electricity would be available both for lighting and heating, and upon that assurance the agreement was entered into. He had no doubt that the representation was innocently made by Mr. Algar—that is to say, Mr. Algar believed it was true. He built the house equipped for a supply of electricity.

Mr. Norman went into the premises and endured it for a time but eventually left in October, 1936. He was entitled to have the agreement to purchase rescinded, to be repaid the £25 paid as deposit, and he was also entitled to a further sum of £25 by way of damages. Mr. Algar must pay Mr. Norman's costs of the action. Judgment was entered accordingly, and the Judge directed that the agreement should be delivered up to be cancelled.

Aldington, who discussed the development of the electric lamp from the early days of the carbon filament to the modern electric-discharge lamp. He explained the operating principles of the discharge lamp and the difficulties which had to be overcome. Finally, he demonstrated the practical use of invisible ultra-violet rays emitted by discharge lamps, and showed how they could be converted into visible light by fluorescent powders, which had an important bearing on colour correction. Mr. J. M. Waldram read a paper on "Modern Street Lighting" and by means of lantern slides explained the principles of planned street lighting. He also emphasised the importance of correct mounting height and adequate background brightness. The discussion was opened by Mr. W. C. Parker, borough electrical engineer, Fulham, who quoted figures in connection with the operating costs of electric discharge lighting, and said that it was his experience that on main roads it represented a decided saving on tungsten filament lighting. At the conclusion of the conference the delegates went by motor coach on a tour of inspection of London street lighting.

Welding Aluminium

In a booklet on "The Welding and Riveting of Aluminium," just published by the Northern Aluminium Company, it is stated that the welding of aluminium nowadays presents no difficulties provided correct technique and good quality materials are used. Practical instructions are laid down for various processes. The welding of aluminium and its alloys are divided into three main classifications:—(1) Fusion or autogenous welding using oxy-acetylene or oxy-hydrogen flames. (2) Electric-arc fusion welding, including metallic-arc, carbon-arc and atomic-hydrogen-arc welding. (3) Electric resistance welding, including butt, spot and seam welding. Details of materials and equipment given include choice of welding rod or wire, the adjustment of welding flames and preheating. The latter part of the booklet is devoted to the design of riveted joints and methods of application. Also included is a series of comprehensive tables giving the mechanical properties of aluminium alloys and welded and riveted aluminium alloys under various conditions.

Wages in the Contracting Industry

The National Federated Electrical Association informs us that there will be an increase of ½d. an hour in the wages of electricians employed by its members as from the second pay day in February (for the period covered by that pay day). The scale will then be:—Grade A, 1s. 9¾d., subject to an addition of 5 per cent., making a total of 1s. 10¾d. (including travelling allowance); Grade B, 1s. 7¾d. (subject to 1d. per hour travelling allowance in certain districts); Grade C, 1s. 6¼d. (in Belfast subject to an addition of 3 per cent.); Grade D, 1s. 5¼d. The rates will remain in force up to and including the first pay day in June next for the period covered by that pay day.

E.C.A. (Northern Section) Dinner

The annual dinner of the Northern Section of the Electrical Contractors' Association was held at Newcastle on December 1st. Mr. R. W. Leek presided, and others present included the Deputy Lord Mayor of Newcastle (Councillor T. McCutcheon), Messrs. A. Smith (vice-president, E.C.A.), J. Walsh (chairman of the Northern Section), L. C. Penwill (director and secretary of the E.C.A.), S. Ellis (North-Eastern Electric Supply Co., Ltd.), and P. McArdle (area organiser, E.T.U.). Proposing "The E.C.A.," Mr. Ellis said the strides made by the industry in recent years were not due to the efforts of individual branches but to the co-operation and team work of all sections. During the past year the North-Eastern Electric Supply Co., Ltd., had connected up 21,127 new consumers. The value of orders placed was £250,000. Mr. Ellis mentioned that the Northern Section of the E.C.A. was the second largest section in the country. Mr. A. Smith, replying, said that the extension of the industry to rural areas was developing a lot of contractors who were not always reliable. He stressed the danger of using cheap electrical fittings and of installations by unqualified contractors. Mr. Leek proposed "The Guests," and the Deputy Lord Mayor of Newcastle replied.

The amateur symphony orchestra of London Associated Electricity Undertakings, Ltd., at the Kingsway Hall, London

A Church Lighting Installation

An excellent example of an efficient church lighting installation is that of St. Modwen's Church, Sutton-in-Ashfield, which has recently been carried out, G.V.D. Illuminators, Ltd.,

A G.V.D. lighting installation at St. Modwen's Church, Sutton-in-Ashfield

being responsible for the planning and equipment in collaboration with the architect, Mr. L. Dodsley. The main lighting in the nave is provided by indirect fittings sunk into recesses under the windows. The entire body of the church is flooded with ample glareless and shadowless lighting without any visible source. Two fittings are placed in the angle of the walls behind the chancel arch to give general lighting over the choir area, and a further fitting is placed in the centre of the ceiling behind the beams over the altar. These fittings are semi-indirect and are arranged so that no glare or bright spots can distract the clergy or choir, and they are invisible to the congregation in the body of the church. The general contractors were H. Rouse & Sons, of Mansfield-Woodhouse.

For Sale

Blackburn Electricity Department has for disposal house service meters.

(See our Classified Advertisements.)

Symphony Concert by Electricity Undertakings

In these days of "canned" music it is refreshing to learn that London Associated Electricity Undertakings, Ltd., have formed an amateur symphony orchestra and choir of ninety performers. They are to be heartily congratulated upon their first public appearance for their excellent performance of an ambitious programme. This took place on Thursday last week at the Kingsway Hall, London, the acoustics of which seem far from flattering. Although at the beginning Mr. J. O. E. Steele, the conductor, appeared to be a little nervous he soon got into his stride, and too high praise cannot be given to the rendering of Haydn's "London" symphony and Mendelssohn's overture "Ruy Blas." At all times the orchestra was held well together.

Bolton Protests Against Rising Costs

A protest against the rising cost of materials has been passed by Bolton Corporation which "views with concern the unchecked increase in the prices of materials required by the Electricity Department and is of the opinion that the disturbing and unjustified increase in prices is inconsistent with any conception of patriotism or national prosperity. Therefore, in the best interests of the country and of efficient and economical administration the Corporation urges upon the Government the necessity of taking such steps to prevent this unjustifiable inflation of prices."

Eyestrain Prevention

A useful novelty has been prepared by the Edison Swan Electric Co., Ltd., to link up with the "Better Light-Better Sight Campaign." This takes the form of a book

rest which is adjusted to give the correct position of a book for reading. Suggestions are printed on the book rest for obtaining correct lighting and the opportunity is taken of pointing out the advantages of "Royal Ediswan" lamps.

Coach Station Lighting

A new lighting installation has recently been carried out to the design of G.E.C. lighting engineers at the Victoria Coach Station in Buckingham Palace Road, London, for London Coastal Coaches, Ltd. The importance of this station from a road travel point of view may be gauged from the fact that over five million passengers use it annually, and that on busy

Victoria Coach Station illuminated by means of "Osira" luminescent lamps

days in the height of the holiday season 60,000 passengers are carried daily by the 2,200 motor coaches using this station. As the station is in operation for practically twenty-four hours daily throughout the year, much depends on efficient lighting for handling this volume of traffic at night. The actual coach operation area of the station is divided into two parts, an open air section to meet the requirements of the London County Council with regard to fire risks, and a covered section. The new lighting system consists of 400-W "Osira" luminescent lamps housed in "Saaflux" dispersive and parabolic angular reflectors. The open section, as well as the parking and waiting space, is illuminated by five lamps only, mounted on steel columns and brackets at a 20-ft. mounting height. The covered section, which comprises sixteen departure bays, is illuminated by nine 400-W "Osira" luminescent lamps in G.E.C. dispersive reflectors at 20-ft. mounting height, spaced in staggered formation, to provide the whole area with high-intensity illumination. These nine new lighting units replace twenty 200-W filament lamps and fittings previously in use and have resulted in a 10 per cent. saving in consumption. This is an early example of the use of the luminescent (fluorescent coated) lamp introduced to the market last week.

The Smithfield Show

From the electrical point of view this year's cattle show, now being held by the Smithfield Club at the Royal Agricultural Hall, Islington, is especially notable for the growing interest of butchers in refrigeration equipment. A new type of low-temperature offal cell incorporated in one of the J. & E. Hall refrigerators is attracting a good deal of attention, and we noticed considerable activity on the stands of York Shipley, Ltd.; G. Rushbrooke (Smithfield), Ltd.; Smithfield Refrigerator Co., Ltd.; West, Ernest & Beynon, Ltd.; and Frigidaire, Ltd. A complete butcher's shop window with refrigerated marble slabs forms the centrepiece of the last-mentioned company's exhibit, which also includes an abattoir cold room with a forced-air dryer driven by a 5 h.p. compressor, a 100-gal. per hour milk cooler, a range of compressors, a display counter, and air-conditioning apparatus. The electric drive has become almost a *sine qua non* of all but the smallest types of butchers' machinery in the way of mincers, mixers, cutters, sausage machines, &c., examples of which are shown by the Alexander Mfg. Co., Ltd.; Herbert & Sons, Ltd.; Hobart Mfg. Co., Ltd.; Peerless Electrical Mfg. Co., Ltd.; and J. C. Wetter & Co. Returning to the show after an absence of seven years, the Silent Machine & Engineering Co. introduces an impressive streamlined meat-cutter (the "Swift") of a most hygienic design, having what may be best described as a "whirlpool" action. Among the equipment for farm purposes, dairy apparatus, including milkers, coolers, cream separators, sterilisers, bottle washers and fillers, is by far the most plentiful, appearing on the stands of Gascoigne's (Reading), Ltd.; Vaccar, Ltd.; J. & R. Wallace; Alfa-Laval Co., Ltd.; Aveling-Barford, Ltd.; Martin's Cultivator Co., Ltd.; and Perkins Clean Milk Equipment, Ltd. Dairy equipment is also to be found among a general display of electrical farm equipment on R. A. Lister & Co.'s stand. Examples of various types of oil engines, electric generator sets, pumping plant, &c., are contributed by Petters, Ltd.; Ruston & Hornsby, Ltd.; Thomas & Son (Worcester), Ltd.; Bernard-Engines; and Swinson's Engineering Works. An electrically-operated elevator and stacker is demonstrated by Blackstone & Co., Ltd. Shearing and clipping machinery is a speciality of the Wolseley Sheep Shearing Co., Ltd., and the Cooper-Stewart Engineering Co., Ltd. The latter company is showing for the first time the "Oakes" incubators and brooders, available in 60, 100, 500 and 1,200-egg sizes. Sprouting cabinets for producing green fodder are made by Intensive Cultivations, Ltd., and Sprout Process. The Show ends to-night.

Trade Announcements

The Mechanical Utilities Co., Ltd., has removed to "Brook House," 29-31, Brook Green Road, Hammersmith, W.6 (telephone: Riverside 2521).

Mr. D. G. E. Barrie, 24, Middleton Avenue, Hove, and Exchange House, Old Change, London, E.C.4, has been appointed sole agent for London, Surrey, Kent, Hampshire and Sussex for George Turnock, Ltd., Birmingham, manufacturers of bakelite accessories, including heat and light adaptors, push-bar holders, ceiling roses, &c.

Orders Recently Booked

F. W. Brackett & Co., Ltd., of Colchester, have been awarded the contract for the manufacture and installation of water screening plant with auxiliary equipment for the Upper Boat Station of the South Wales Electric Power Co., to the order of Edmundsons Electricity Corporation, Ltd.

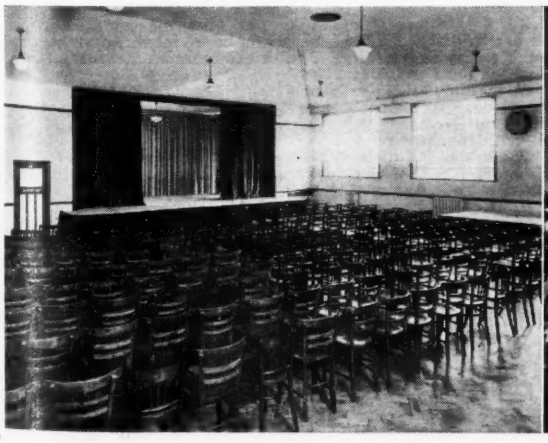
The Post Office has placed large orders for stoneware conduits for underground telephone lines. According to the *Financial Times*, among the companies sharing in the contracts are understood to be Associated Clay Industries, Doulton & Co., and Leeds Fireclay. Reports that the value of the orders exceeds £1,000,000 are considered in authoritative quarters to be exaggerated.

Change of Name

Power Contracts (Batwin), Ltd., has changed its name to Batwin Electric Motors, Ltd. The construction, directorate and policy of the company remain unaltered.

Cable Works Canteen

On December 3rd the new canteen of the Dagenham Cables Sports Club (the sports and social organisation of the Union Cable Co., Ltd., and Southern United Telephone Cables, Ltd.) was inaugurated by Sir George Lee (President, I.E.E. and Engineer-in-Chief, G.P.O.).



The main hall and all-electric kitchen at the Dagenham Cables Sports Club's new canteen

Prior to the opening ceremony a luncheon was given at the Waldorf Hotel, London, when many well-known men in the cable industry were entertained by Mr. J. Snow Huddleston (managing director of the Union Cable Co., and its associated company, and president of the Sports Club). Following this the guests were conveyed to the companies' works at Dagenham, when a tour of inspection was made. The main hall of the canteen can be used for concerts, dances, boxing contests, &c. The kitchen equipment is all-electric (Jackson's) and has been transferred from the old canteen, being supplemented by a new hot cupboard, fish fryer and steamer. Hot water is provided by a 100-gal. tank with two Santon immersion heaters, thermostatically controlled. Benjamin Electric, Ltd., designed the lighting lay-out and manufactured the fittings, provision being made for additional lighting effects on special occasions. Exhaust fans have been installed for ventilation, and the equipment also includes electric clocks, fire and fire-alarm points and automatic telephones.

Social Events

The annual dinner-dance of Collins Electrical, Ltd., was held at the Corner House, Strand, on November 27th. The occasion was very informal and speeches were kept as brief as possible in order to allow ample time for the dancing and the excellent cabaret. Mr. C. F. Collins, A.M.I.E.E., chairman and managing director, stated that his firm had repaired over 130,000 machines in the past twenty-three years.

To celebrate the opening of a new office block and other works extensions Dewhurst & Partner, Ltd. (a subsidiary of Marryat & Place, Ltd.), entertained a large party to a dinner at Inverness Works, Hounslow, on December 4th. After the dinner the works, which were kept running for the purpose, were thrown open for inspection to 250 visitors, who had an opportunity of studying every process in the making of automatic electrical switchgear. The chairman of the company attributed the splendid organisation and progress made to the work of the managing director, Mr. Dewhurst, and the works manager, Mr. Brook, and he thought that Mrs. Dewhurst was largely responsible for the magnificent spirit existing.

The annual installation staff dinner of Ericsson Telephones, Ltd., was held at Lysbeth Hall, Soho Square, W.1, on November 29th. Mr. H. Hogarth, chief installer, took the chair, and among the 126 attending were Messrs. T. H. Edgerton, C. H. Philips and J. Reading, of the Post Office, Messrs. Limb and Maxwell-Smith, of Beeston, and Messrs. Munday and Westray, of Ericsson's head office staff.

Prices of Materials

Henry Gardner & Co., Ltd., report, December 8th: No change in the price of copper bars (best selected), sheet and rod. English pig lead, £18 5s., 5s. increase. Spelter, £15 13s. 9d., 6s. 3d. increase. English block tin, £197 5s., £12 5s. increase.

Frederick Smith & Co. report, December 8th: Electrolytic copper bars, £47, £2 increase. Ditto, ditto, wire rods, £52 10s., £2 increase. Ditto, ditto, h.c. wire, 8⅝d., ¼d. increase. Silicium bronze wire, 9¼d., ¼d. increase.

Edward Till & Co. report, December 8th: No change in the price of India rubber, Para fine.

A Cookery Demonstration

A casserole cookery demonstration was held on Wednesday last at the showroom of the Hendon Electric Supply Co., Ltd., in collaboration with the magazine *Woman*. The demonstration, the first of a series, was opened by Miss Enid Trevor, the film actress.

Road Lighting

Philips Lamps, Ltd., has issued an attractive booklet entitled "Nights On the Road." This consists of a number of illustrations reproduced from actual photographs, comparing badly lighted roads with those illuminated by "Philora" sodium and mercury electric discharge lighting. Two "knights" of the road briefly tell the story of the advantages of this form of illumination.

New Catalogues and Lists

Hopkinsons, Ltd., Huddersfield.— Details of the "Moynan" patent steam purifier.

Goodliffe Electric Supplies, Ltd., 8, Eagle Street, High Holborn, London, W.C.1.—A catalogue of overhead line fittings.

G. E. Marbaix, Ltd., 22, Carlisle Place, London, S.W.1.—A leaflet dealing with the "Detroit" power screwdriver.

D. G. E. Barrie, 24, Middleton Avenue, Hove, 3.—A folder illustrating "Gleco" lighting fittings.

E. P. Barrus, Ltd., 35/37, Upper Thames Street, London, E.C.4.—Leaflets dealing with "Stanley" soldering irons.

Electroservice, Ltd., 31, Waterloo Road, London, S.E.1.—A leaflet illustrating domestic electrical appliances

Short & Mason, Ltd., Aneroid Works, London, E.17.—A booklet describing the "Pavaex" passive vascular exerciser.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2. —A brochure giving the results of tests by the N.P.L. on batches of lamps purchased at random. The average actual lumen output in percentage of "nominal values" was 100.04 per cent., the actual initial efficiency of the coiled coil type being: 40W, 29 per cent.; 60W, 21 per cent.; and 100W, 19 per cent.

Eastwoods, Ltd., 47 Belvedere Road, London, S.E.1.—Catalogue of inset, outset and portable type electric fires.

B.T.H. Co., Ltd., Crown House, Aldwych, London, W.C.2.— A broadsheet illustrating "Mercra" electric-discharge lamps, including the fluorescent type.

British Insulated Cables, Ltd., Prescot.—A catalogue of condensers for power factor improvement.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—A folder dealing with electrical gifts for the Christmas season. Also a brochure on the "Osira" luminiscent lamp.

Turner's Asbestos Cement Co., Trafford Park, Manchester, 17.—Details of "Siluminite" asbestos insulating and arc resisting mouldings.

Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E.17.—A booklet dealing with the maintenance of permanent way on railways by electric arc welding.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—A complete illustrated catalogue of "Universal" domestic electrical appliances.

Electrical Components, Ltd., 102, Snow Hill, Birmingham, 4. —A 36-page catalogue of commercial lighting fittings.

Marconi-Ekco Instruments, Ltd., Electra House, Victoria Embankment, London, W.C.2.—Leaflets appertaining to circuit magnification meters, dynamic resistance meters, dielectric loss tests, inductance bridges, and series loss tests.

Claude Lyons, Ltd., 76, Old Hall Street, Liverpool.—An 80-page catalogue of instruments and laboratory apparatus.

Marryat & Scott, Ltd., 75, Clerkenwell Rd., London, E.C.1.— A folder dealing with the lift installation at the Athenæum Court Flats, Piccadilly, London.

A. Reyrolle & Co., Ltd., Hebburn-on-Tyne.—Leaflets dealing with electric arc welding equipments and metal-clad switchgear.

Siemens & General Electric Railway Signal Co., Ltd., East Lane, Wembley.—A catalogue of point machines for signalling equipment.

Electro-Dynamic Construction Co., Ltd., St. Mary Cray, Kent. —A supplementary leaflet dealing with convertors for television receivers.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—Leaflets illustrating new table standards in pottery.

Bankruptcy Proceedings

R. Corbett and **I. A. J. Merritt,** carrying on business under the style or firm of Corbett and Merritt, 2b, Junction Road, Andover, Southampton, electrical and radio engineers.—At the public examination held at the Guildhall, Salisbury, on December 2nd it was reported that there were joint ranking liabilities of £517, and there were net assets of £164, leaving a deficiency of £354. The separate estate of Merritt disclosed gross liabilities of £467, of which £15 was expected to rank for dividend, with net assets of £2 and a deficiency of £12. Corbett's separate estate showed ranking liabilities of £4 and estimated assets of £105. Of the joint liabilities it was stated that £244 was due to cash creditors, one of whom had since intimated that her loan of £200 was a gift and the liabilities would be reduced accordingly. Merritt said that their failure was due to insufficient trade to cover establishment expenses and losses on sales of radio goods through hire-purchase agreements. The Official Receiver pointed out that since the bankruptcy proceedings commenced, Corbett had become entitled to a legacy of about £300 which would be taken into the joint estate. The examination was closed.

Nottingham Crystal Twinlight Co., 11, Bilbie Street, Nottingham, and lately carrying on business at Trinity House, Forman Street, Nottingham, electric lamp dealers.—The public examination of L. A. Howe and W. H. Walton, trading as above, was held at the County Court House, St. Peter's Gate, Nottingham, on December 2nd, when it was reported that the joint deficiency was £194. Howe stated that he commenced dealing in electric lamps in August, 1936, and eventually Walton joined him in partnership. The sales at first were between £7 and £8 a week, and in November last year increased to about £40 weekly, but a large proportion of the profits was absorbed in canvassers' travelling expenses, wages and commission. Howe attributed the failure to insufficient turnover and lack of capital. The examination was closed.

G. L. Branford, 63, Margate Road, Ramsgate, radio and electrical engineer.—The public examination took place at the Guildhall, Canterbury, Kent, recently. Debtor had returned liabilities of £100 and assets of £32, leaving a deficiency of £68. The examination was closed.

C. Thornton, radio dealer, Radio Store, Main Street, Ffynnongroew.—Trustee, Mr. I. D. Hooson, St. Peter's Churchyard, The Cross, Chester, Official Receiver, released November 22nd.

R. Terrell, electrical apparatus manufacturer, Aldwych House, Aldwych, W.C.2.—Receiving order made November 25th on a creditor's petition. Public examination February 8th at Carey Street, W.C.2.

R. C. Marshall (Northern Service Depôt), radio dealer, 318, Stretford Road, Manchester.—Last day for receiving proofs for dividend December 15th. Trustee, Mr. A. T. Eaves, 47, Mosley Street, Manchester.

E. Cohen (Manor Wireless Supplies), radio dealer, 746b, Romford Road, Manor Park, E.—Discharge suspended for nine months until August 3rd, 1938.

P. D. Watkins, radio engineer, 48, High Street, Criccieth.— Trustee, Mr. I. D. Hooson, St. Peter's Churchyard, The Cross, Chester, Official Receiver, released November 19th.

B. H. Auld, electrical engineer, 66, Victoria Street, S.W.— Second dividend of 4s. in the £, payable December 10th at 1-2, Bucklersbury, E.C.4.

Company Liquidations

Strand Electric & Engineering Co., Ltd.—Meeting January 3rd at Aldwych House, W.C.2, to receive an account of the winding-up by the liquidator, Mr. R. Hunter. This notice is formal and relates solely to the old company in liquidation for the purpose of reconstruction.

Bishop Radio Stores, Ltd.—Meetings December 28th at 128, Romford Road, Stratford, E.15, to receive an account of the winding-up by the liquidator, Mr. W. S. F. Stagg.

Electricity Supply

Lighting, Domestic, Power

Accrington.—ELECTRICITY CHEAPER.—Under a new scale of charges lighting will cost: 3¼d./3d. per kWh according to quantity. Signs, heating and domestic purposes (other than lighting), 0.6d. per kWh. Alternative tariff for lighting, heating and domestic purposes on the rateable value basis: 12½ per cent. per annum on the first £100 and 5 per cent. over £100, plus a charge of ¼d. per kWh for the first 250 kWh, and ¼d. per kWh over 250 kWh per quarter. Power users: 0.9d. per kWh, with a minimum of 7s. 6d. per quarter. Consumers using a minimum of 10,000 kWh per month: First 50,000 kWh per month at 0.62d. and over 50,000 kWh per month at 0.5d., subject to a recognised discount and to a fluctuation based on the cost of fuel of 0.001d. per kWh for each 1d. rise or fall above or below 15s. per ton. Shop-window lighting after ordinary hours: ¼d. per kWh, plus 10s. per quarter rental of switch. Discount: 10 per cent.

Barnoldswick.—METER TESTING.—Permission to set up a meter-testing station has been obtained from the Electricity Commissioners. Originally, the Commissioners suggested that the Council should have all local meters tested at Colne, Nelson or Burnley.

Birkenhead.—CHANGE-OVER.—Sanction is being sought by the Electricity Committee to a loan of £2,500 for replacing or adapting consumers' apparatus in connection with the change-over.

STREET LIGHTING.—Electric lamps are being substituted for gas lamps in the principal thoroughfares. The latest conversion is the section from Witton Stocks to Feniscliffe Bridge, which is now illuminated by electric-discharge lamps.

Blackburn.—MAINS AND SERVICES.—The Corporation is seeking permission to borrow £60,000 for mains and services.

Brierfield.—SODIUM LIGHTING.—The Council proposes to install sodium lighting along the main Burnley Road and Colne Road.

Burnley.—AUDITOR'S REPORT.—The elective auditor states in his annual report that the net revenue surplus of the Electricity Department, held for the purpose of carrying stocks and the balances outstanding for prepayment meter wiring and appliances on deferred payment, was insufficient for these purposes and ought not to bear any further contributions to the rates until it stands at a substantially higher figure, especially having regard to the expansion in prepayment meter wiring. At the year end stock and amounts owing for appliances on deferred payment and for prepayment meter wiring amounted to £131,344, and the net revenue surplus stood at £44,184.

Canterbury.—CHURCH AND SCHOOL HEATING.—A recommendation of the Electricity Committee that the tariff for electricity supplied to schools and churches for heating shall be calculated at the rate of ½d. per kWh where the total supply during the year exceeds 100,000 kWh has been adopted by the City Council.

STREET LIGHTING.—The experimental mercury electric-discharge lamps in London Road are to be retained by the City Council.

Cardiff.—MAINS.—The Electricity Committee is to extend mains at a cost of £6,049, erect a sub-station in Sandon Street (£7,494) and lay feeders from Roath power station (£19,110).

THREE KWH A PENNY.—Reductions in tariffs which will cost the Electricity Department £38,000 will become operative in the next quarter. It is proposed to reduce the flat rate for lighting from 3¾d. to 3d. per kWh and the "all-in" tariff from ½d. a kWh to ¼d. per kWh.

Carmarthen.—ELECTRIC LIGHTING.—The Public Lighting Committee of the Town Council met in private last week and accepted a tender by the Carmarthen Electric Supply Co., Ltd., for the public lighting for the next three years.

Cheltenham.—EXTENSIONS.—The Electricity Committee is to extend its 11,000-V distribution system at a cost of £7,053.

METER TESTING.—Equipment for meter testing is to be provided at a cost of £584.

Colchester.—NEW EQUIPMENT.—At a recent meeting of the Town Council it was resolved to put in hand works for the supply of electricity to premises on the St. Mary's Lodge estate.

Consett.—OVERHEAD LINE.—No objection is being raised by the Urban District Council to the scheme of the North-Eastern Electric Supply Co., Ltd., to erect an overhead line to the Consett and Benfieldside sewage works.

Coventry.—LOAN.—Sanction is being sought by the Electricity Committee to borrow £12,334 for extension of mains and sub-station equipment.

Eastbourne.—SUB-STATION.—The Electricity Committee is to provide a sub-station at Hyde Gardens at a cost of £2,700.

EXTENSION.—A sum of £1,160 is to be spent on laying mains to supply 90 houses on the Willingdon Garden estate.

METER TESTING.—An expenditure of £1,600 on meter-testing apparatus has been authorised.

Eccles.—A LARGE CONSUMER.—In order to meet the increased demand of Gardner & Sons, Ltd., for their Barton Hall engine works the Electricity Department is to lay an extra-high-voltage cable between Lorne Street sub-station and the company's sub-station and install a 6,600-V control panel in the former. The increased supply is required for electric furnaces and further motive power, and will bring the company's annual consumption up to more than two million kWh.

Edinburgh.—ELECTRIC HEATING.—The General Purposes Committee has approved electric heating apparatus being installed in the dressing cubicles at the Portobello Bathing Pool, and recommends that the work shall be carried out at a cost of £850.

Eston.—LOANS.—Sanction has been obtained by the Electricity Committee to a loan of £2,000 for services, and the Committee is seeking sanction to borrow £1,000 for meters and £1,000 for domestic apparatus.

Flintshire.—CONFERENCE OF LOCAL AUTHORITIES.—Convened by the Flintshire County Council, a conference of representatives of local authorities in Flintshire has been held at Mold to consider the future control and distribution of electricity in North Wales. The North Wales and South Cheshire Association desires the establishment of one public authority for the whole area, whereas the North-Western and North Wales Committee proposes the maintenance of municipal control in the separate districts of the area.

Folkestone.—LIGHTING.—A large part of the additional lighting erected in Folkestone in connection with the conference of the Association of Public Lighting Engineers is to be retained.

France.—INCREASE IN PRODUCTION.—Figures for the first nine months of this year show an improvement in both thermal and hydraulic production of electricity. As regards thermal stations, the quantity of electricity generated up to the end of September this year of 2,646 million kWh compares with 2,480 million kWh in the corresponding period of last year. With hydraulic production increasing to 6,397 million kWh from 5,790 million kWh, the total production for the first nine months of this year rose to 9,043 million kWh from 8,270 million kWh last year.

ELECTRICITY AT LOCAL FAIRS.—On the occasion of the recent Montargis annual fair the local distribution company built a large stand including, on one side, all the various types of electric ranges and heating equipment, and on the other side electrical apparatus for a bathroom. In the kitchen section interest was fostered by cookery demonstrations in the open air, with the distribution of the food prepared to the spectators. The plan has been adopted now for about four years, and the company feels that these stands at the annual fair have been largely responsible for the sale of over 800 ranges, not to mention quantities of small equipment, during that period.

Guildford.—ALL-IN TARIFF.—The Electricity Committee is to confer with the Housing Committee upon the arrangements for applying the "all-in" tariff to Council Houses.

Hull.—EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £15,000 for prepayment meters and £50,000 for sub-stations.

Irish Free State.—DUBLIN LIGHTING PLANS.—A scheme providing for the improvement of street lighting in Dublin at an estimated cost of over £52,000 has been submitted by the Irish Free State Electricity Supply Board to the Dublin Corporation. In April last the Corporation adopted the city engineer's report covering a three years' programme of changing over from arc lamps to filament lamps in the principal thoroughfares. The special lighting sub-committee of the Corporation has adopted the engineer's report, subject to a reduction in the cost of electricity, to bring the running expenses of the scheme down to £4,000 per annum instead of the E.S.B.'s £4,993. To this the Board has agreed, and considers that it will be possible to complete the central city scheme by next winter. The Corporation recently fitted a mile of the Dublin-Blackrock road with sodium lamps as an experimental measure, and the resultant improvement in visibility has been favourably commented upon.

Kettering.—ELECTRIC HEATING FOR SCHOOLS.—The electrical engineer and manager, Mr. W. A. Walker, is to submit to the Education Committee a detailed report on the proposed electric heating of the new Henry Gotch School. The Ronald Tree Nursery School is to be heated by electricity.

STREET LIGHTING.—Further central lamps are to be placed in London Road and Rockingham Road. Besides this, fifty-one additional street lamps are to be erected. The sodium lamps removed from Station Road after protests by pedestrians are to be erected in Rockingham Road.

Leeds.—ELECTRIC LIFT.—Quotations are to be obtained for the provision of an electric lift at the Gateforth sanatorium.

Littleborough (Lancs).—POWER PLUGS IN COUNCIL HOUSES.—The Council wishes to install power plugs in houses erected under the Housing Act, 1919, but is encountering difficulty owing to a ruling of the Ministry of Health that it is not prepared to allow the cost of power plugs in such houses to rank for the purpose of subsidy or to be charged to the housing repair fund. It was stated at the last meeting of the Council that the Electricity Committee and the Housing Committee would try to devise some means to overcome the difficulty.

Liverpool.—SUB-STATIONS.—Application has been made by the Electric Power and Lighting Committee for sanction to borrow £100,000 for sub-stations.

Llangefni.—CHANGE-OVER.—The North Wales Power Co., Ltd., is changing over the system of supply in the area from

d.c. to a.c. The company's new showrooms and offices in Llangefni will be ready for occupation early in the New Year.

London.—BATTERSEA.—The Electricity Committee is to provide 215 electricity services at a cost of £1,566 and is to spend £1,338 on meter-testing instruments.

ST. PANCRAS.—Mains are to be extended by the Electricity Committee at a cost of £3,032 and sub-stations are to be erected on three housing estates at a cost of £18,881.

ST. MARYLEBONE.—The Electricity Committee has obtained sanction to borrow £23,925 for the acquisition of the various properties in Aybrook Street and Blandford Street required for the development of the distribution section of the undertaking. Meter-testing equipment is to be purchased at a cost of £650.

CAMBERWELL.—The Public Service Committee recommends the acceptance of the offer of the South Metropolitan Electric Light and Power Co., Ltd., to supply electricity for the crematorium furnace at ¼d. per kWh at all hours except between 4 p.m. and 8 p.m. throughout the winter quarters. The charge for supply during the excepted period is to be 1¼d. per kWh for the first 100 kWh per quarter and 1d. per kWh for all in excess. The minimum charge has been fixed at £120 per annum for five years.

Loughborough.—LOAN.—The Electricity Committee is seeking sanction to a £5,000 loan for mains and services.

New Zealand.—WELLINGTON.—A considerable expansion in electricity supplies during 1936-37 is shown in the annual report of the general manager of the City Electricity Department (Mr. M. Cable). Total sales increased by 16 per cent. to 73.3 million kWh, and 1,309 additional consumers were obtained making the total 36,764. The annual load factor improved from 39.1 to 40.9 per cent. A reduction of 0.16d. in the average revenue per kWh for all supplies brought the amount down to 1.10d. The surplus on the year's working was £29,404, against £43,401 in the previous year.

Palestine.—INCREASED USE OF ELECTRICITY.—Despite the political tension and the consequent check to industrial expansion the output of electricity during the first eight months of the current year totalled 50½ million kWh, as compared with 44½ million kWh in the corresponding period of 1936, representing an increase of 13 per cent.

Penpont (Dumfriesshire).—CHURCH HEATING.—Electric heating was inaugurated on December 5th in the parish church. The equipment comprises electrically heated pipes placed under each pew and over the entrances to the church, and five convector heaters. Pipes and heaters are under thermostatic control, regulated to 60 deg. F. The scheme was in the hands of the County Council Electricity Department and was contracted to Gordon and Moodycliffe, Dumfries.

Rawtenstall.—FRINGE ORDER.—Application is to be made by the Electricity Committee for a Fringe Order to permit the Corporation to supply electricity to premises in the Dunnockshaw and Habergham Eaves districts.

Rowley Regis.—BETTER LIGHTING.—The lighting is to be improved in City Road from the Wheatsheaf to the Birmingham-Wolverhampton Road, involving the erection of forty new lamp standards and the installation of three-light lamps in lieu of the present two-light lamps.

Scotland.—CALEDONIAN POWER BILL.—There are several clauses differing from those in the previous Order, and also some additional clauses, in the Caledonian Power Provisional Order promoted by the British Oxygen Co., Ltd., which has now been lodged in the Scottish Office. Clause 68 states that the company shall pay to the Inverness County Council annually for a period of ten years the sum of £1,500 in respect of any loss which may result by reason of the depreciation of the rateable value of lands and heritages in the county owing to the exercise of the powers of the Order. Clause 78 lays it down that the company shall construct the works authorised and exercise all the powers conferred by the Order in such a manner as to preserve, so far as is reasonably practicable, the beauty of the scenery and the amenity of the surroundings in which the works are situated, and that all buildings erected by the company shall be constructed of such materials as shall be most suited to the character of the district. After the clause providing for a supply of electricity by the company in the "area of supply" there is a clause which states that if the Inverness County Council shall at any time after the commencement of the Order apply for an Act, Provisional Order or Special Order to authorise it to supply or use electricity the company shall not oppose such application except so far as may be necessary in order to secure the insertion in such Act or Order of clauses or amendments to protect its lines and works, and with respect to any provisions which may be contained in any such Act or Order as to the taking over of any supply then given by the company or its lines or works connected therewith.

Southgate.—CONTROL OF UNDERTAKING.—In June last the Borough Council approved of notice being served on the North Metropolitan Electric Power Supply Co. requiring it to retransfer the Southgate undertaking to the Council on August 2nd, 1938. At a meeting of the Council last week the Electricity Committee reported that the absence of a detailed statement at that stage must not be taken to imply that the Committee had made no progress. It felt confident that the Council would accept its assurance that the matter was at present in so delicate a stage that a full report was neither possible nor desirable. It therefore trusted that it might con-

Progress in Home Counties

THE latest report of the proceedings of the London and Home Counties Joint Electricity Authority deals with the twelve months ended March 31st last. The Electricity Commissioners have, however, given instructions, following representations by the Conference of Joint Electricity Authorities, Joint Advisory Boards, and Joint Committees, that the year of account of such authorities shall in future be the calendar year. Accordingly, the estimates of income and expenditure set out in the report are for nine months only.

A further substantial increase in kWh sent to feeders is shown in the statistics of the Authority's local distribution undertakings set out in the accompanying table. The total increase of 22.6 million kWh is equivalent to 20 per cent., and follows an improvement of 28 per cent. in the previous year.

District	Millions of kWh to Feeders		Maximum demand (kW)		KW connected		Number of consumers	
	Year ended March 31st		Year ended March 31st		At March 31st		At March 31st	
	1937	1936	1937	1936	1937	1936	1937	1936
Dorking ...	6.5	5.4	2,200	2,100	19,822	16,929	5,426	4,975
Leatherhead	11.0	9.1	3,869	3,566	28,397	23,898	7,207	6,462
Surbiton ...	14.8	12.2	5,865	4,535	51,590	41,797	12,949	11,643
Sutton ...	56.0	46.1	19,425	17,225	106,256	83,100	51,158	47,222
Twickenham	43.9	37.0	14,210	13,575	110,870	91,657	35,037	31,230
Weybridge	2.3	2.1	904	932	5,451	4,954	1,950	1,887
Totals ...	134.5	111.9	46,473	41,933	322,386	262,335	113,727	103,419

Additional kW connected numbered 60,051 (23 per cent.), and the net increase in the number of consumers was 10,308 (10 per cent.). The average price per kWh sold was 1.719d., against 1.832d. in the previous year.

No fewer than 82,305, or 72 per cent., of the consumers at March 31st last were paying for their supplies under two-part tariffs, and 15,246 had assisted wiring installations. Applications for electric cookers on hire continued to be numerous, and the number in use at March 31st—19,669—was 4,725 more than at March 31st, 1936. Kettles on hire increased by 4,649 to 18,750, irons by 2,023 to 6,700, wash boilers by 1,131 to 3,818, and water heaters by 1,215 to 3,097. A scheme for selling refrigerators on deferred terms was initiated and 223 were sold. Miles of mains laid during the year numbered 105, against 109 in 1935-36. With regard to the scheme for the electrification by overhead lines of the rural areas south of Dorking, applications for supplies up to March 31st numbered 1,804, and 1,571 consumers had been connected. Applications for cookers numbered 702 (519 installed).

Some extension of electric street lighting in the Authority's area is also recorded, the number of lamps connected increasing by 724 to 10,452. Since the close of the financial year a comprehensive scheme has been put into operation at Banstead.

Capital expenditure on the extension of the Authority's local distribution undertakings during the year amounted to £436,603. This outlay was financed out of accumulated sinking funds and borrowings by way of mortgage loans and from the superannuation fund. The amount outstanding in respect of mortgage loans at March 31st last was £484,872. The redemption fund totalled £731,797 at the end of the year, and, in addition, loans repaid amounted to £12,099. A sum of £537,325, part of the redemption fund, was utilised for new capital purposes.

The total annual revenue advanced from £783,682 to £887,261, the gross revenue surplus for the year being £333,089. After charging net revenue items, including interest on capital, and contributions to sinking funds, the excess of expenditure over income for the year was £33,780. This and the adverse balance from the previous year are set against the sum of £67,000, representing the estimated income accrued in respect of electricity supplied to consumers since the date of the last meter readings during the March quarter but not invoiced, leaving an accumulated deficit on net revenue account of £617.

In connection with the expenditure incurred by the Authority in standardisation of the voltage of the Sutton district, the Electricity Commissioners have given effect to the arrangement for revising the terms of certain loan sanctions so as to avoid the cost of this work falling unduly on present consumers. In future years the net revenue account of the Authority will be relieved to the extent of approximately £25,500, which has actually been charged for the year to March 31st, 1937.

tinue to be favoured with the Council's confidence, pending a further report early in the New Year. Councillor A. C. Crane, chairman of the Committee, referred to observations which had been made, from which it might appear that the Council was taking up an attitude hostile to the Northmet Co. He gave a quotation from an official communication showing that the two parties were working together on friendly terms.

South Shields.—LOAN.—Application is to be made for sanction to borrow £25,000 in connection with the second year's instalment of the scheme for reorganising the electricity undertaking and £5,000 in connection with the Corporation's hire-purchase scheme.

Stockton-on-Tees.—PARLIAMENTARY BILL.—It has been decided to promote a Parliamentary Bill which will, among other things, grant facilities to the Corporation to extend its powers with regard to the supply of electricity.

Switzerland.—LARGE COOKING INSTALLATIONS.—Recently published figures show that at the end of 1936 there were 1,338 kitchens operating entirely by electricity. Of these, 710 were in restaurants, 344 in public buildings, and 141 in hospitals. The total connected load was 43,818 kW. During 1935 the number of installations increased by 123 and in 1936 by 103, so that their growth seems to be fairly steady and is expected to continue so for some years to come.

Turkey.—POWER SUPPLY PROGRESS.—The report for the past financial year of the Société Turque d'Electricité, which supplies electric power in the Istambul area, shows that the output during the twelve months amounted to 111 million kWh, as compared with 103 million kWh in 1935, and that the number of consumers advanced from 97,542 to 104,510. The report adds that as against only slight progress in the use of electricity for lighting and domestic-apparatus use there was a marked increase in the industrial demand.

York.—SUB-STATION.—A site has been obtained in Malton Road for a sub-station.

RURAL SUPPLIES.—Electricity is now available in Myton-on-Swale, Flawith and Tholthorpe.

Traction

Great Western Railway.—SPEEDOMETERS FOR LOCOMOTIVES.—As the result of experience with speedometers on engines of the "King" and "Castle" classes of the G.W.R., the "Star" and "Saint" classes are to be similarly equipped, bringing the total number having speed indicators to 250. The standard speedometer equipment, which was made by the British Thomson-Houston Co., Ltd., consists essentially of an a.c. generator driven direct from the driving wheel and a 5-in. dial voltmeter, with a scale graduated to read from 0 to 100 m.p.h., mounted on "Sorbo" rubber blocks in the cab. The drive is imparted by a small return crank incorporated in the crank-pin washer of the right-hand trailing driving wheel. A block on this crank engages in a slotted link mounted on a spindle which is carried on the same centre line as the driving axle by a bracket suspended from the footplate. The slot is sufficiently long to allow for the greatest possible displacement of the driving wheel relative to the footplate bracket. Bevel gears enable the armature of the generator to run on a vertical axis at 2½ times the driving-axle speed. An armoured cable conveys the current, the voltage of which varies with the speed of the engine, to the voltmeter, first passing through a rectifier, so that the voltmeter gives a uni-directional reading for both directions of running. The bracket carrying the voltmeter is fixed to the corner of the boiler just above the reversing screw rack, and heat insulated by fibre washers. The coil in the generator has tappings to permit of fitting to engines with different diameter wheels.

London.—STATION RECONSTRUCTION.—The London Passenger Transport Board has placed a contract for the rebuilding of Sloane Square station. The tunnel will be enlarged so that the platforms can be made about 25 yd. longer, "up" escalators of the latest type will be provided, and on the street level there will be a spacious ticket hall with a central ticket office and a modern buffet.

Manchester.—TROLLEY-BUSES.—Trolley-buses are soon to replace the tramcars on two heavily trafficked routes. Last week Crossley Motors, Ltd., gave a road test at Ashton-under-Lyne to the first of the vehicles which they are supplying to the Corporation.

Newcastle-on-Tyne.—TYNESIDE TRANSPORT BOARD?—It is understood that when a conference of local authorities is held at Newcastle on December 16th to discuss further the report of the Royal Commission on the Unification of Tyneside, one of the questions considered will be the setting up of a Tyneside Passenger Transport Board.

Communications

Australia.—REMOTE RADIO STATIONS.—Within the past two or three years sixty-five miniature radio stations have been established in the remoter parts of Australia and in New Guinea, Papua, Fiji and other Pacific islands, states the *Electrical and Radio Trader of Australasia*. These stations first made their appearance in the form of pedal-driven equipments, but small petrol-driven generator sets are now being adopted where a considerable number of messages is to be exchanged.

Scotland.—ISLAND TELEPHONE LINK.—The Island of Soay, off the south-west coast of Skye, was on December 2nd linked by a radio-telephone installation with Elgol, on the shores of Loch Scaviag, Skye. The new service provides direct telegraphic contact with the mainland.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, December 16th. Institution, London, W.C.2. 6 p.m. Discussion on "Electrical Engineering Education." Papers by Prof. C. L. Fortescue, Col. H. C. Fraser, and Mr. F. H. Clough.

Meter and Instrument Section.—Friday, December 10th. Institution, London, W.C.2. 7 p.m. "Organisation of a Meter Test Department of a Large Supply Undertaking, with Special Reference to the Meters Act, 1936." Mr. C. W. Hughes.

North-Eastern Centre.—Monday, December 13th. The Newe House, Newcastle-on-Tyne. 6.15 p.m. Second Parson's Memorial Lecture. "Scientific Activities of the late Sir Charles A. Parsons." Dr. G. Stoney.

Western Centre.—Monday, December 13th. The Guildhall, Gloucester. 6 p.m. Developments in Telegraph Transmission and Their Application to the British Telegraph Services." Messrs. L. H. Harris, E. H. Jolley and F. O. Morrell.

East Midland Sub-Centre.—Tuesday, December 14th. Electricity Showroom, Derby. "Rural Electrification." Mr. J. S. Pickles.

North-Western Centre.—Tuesday, December 14th. Engineers' Club, Manchester. 7.15 p.m. "Coin Mechanisms, with Particular Reference to Electricity Meters." Messrs. J. Prince and M. Whitehead.

Scottish Centre.—Tuesday, December 14th. North British Station Hotel, Edinburgh. 7 p.m. "Modern Systems of Multi-Channel Telephony on Cables." Col. A. S. Angwin and Mr. R. A. Mack.

Northern Ireland Sub-Centre.—Wednesday, December 15th. Municipal College of Technology, Belfast. 7.30 p.m. Joint meeting with the Belfast Association of Engineers. "Street Traffic Signals, with Particular Reference to Vehicle Actuation." Mr. F. G. Tyack. The usual meeting of the Sub-Centre will be held at 9, Wellington Place, Belfast. 6.30 p.m.

Sheffield Sub-Centre.—Wednesday, December 15th. Royal Victoria Hotel, Sheffield. 7.30 p.m. Informal discussion on "Mercury-Arc Rectifiers." To be opened by Mr. L. C. Bunce.

South Midland Centre.—Wednesday, December 15th. Central Technical College, Birmingham. 7 p.m. Faraday Lecture. "The Evolution of Electrical Power." Dr. A. P. M. Fleming.

Transmission Section.—Wednesday, December 15th. Institution, London, W.C.2. 6 p.m. "Line Protection by Petersen Coils, with Special Reference to Conditions Prevailing in Great Britain." Messrs. H. Willott Taylor and P. F. Stritzl.

Irish Centre.—Thursday, December 16th. Trinity College, Dublin. 6 p.m. Paper by Mr. F. G. Tyack.

West Wales (Swansea) Sub-Centre.—Thursday, December 16th. Technical College, Swansea. 6.30 p.m. "The High-pressure Mercury-vapour Lamp in Public Lighting." Cmmdr. E. L. Damant, and Messrs. G. H. Wilson and J. M. Waldram.

Batti-Wallahs' Society.—Friday, December 10th. Hotel Victoria, London, W.C.2. 12.30 for 12.55 p.m. Luncheon.

British Institute of Radiology (Röntgen Society).—Friday, December 10th. Piccadilly Hotel, London, W.1. 7.30 for 8 p.m. Annual dinner.

Illuminating Engineering Society (*Decorative Lighting Section*).—Friday, December 10th. Institution of Mechanical Engineers, London, S.W.1. 6.30 p.m. Discussion on Problems in Decorative Lighting.

North Midland Centre.—Monday, December 13th. Leeds Tramways Concert Hall, Swinegate, Leeds. 7 p.m. "Decorative and Colour Lighting." Mr. R. Gillespie Williams.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, December 11th. South Wales Institute of Engineers, Cardiff. 6 p.m. Discussion on H.M. Electrical Inspector's Report for 1936.

School of Engineering and Navigation Old Boys' Society.—Saturday, December 11th. Cannon Street Station Restaurant, London, E.C.4. Annual dinner.

Association of Supervising Electrical Engineers (*Manchester Branch*).—Tuesday, December 14th. College of Technology, Manchester. 7.30 p.m. "Modern Industrial Lighting." Mr. L. Tye.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, December 14th. Caxton Hall, London, S.W.1. 7.15 p.m. "Earth Leakage Protection." Mr. H. G. Taylor.

Northern Division.—Thursday, December 16th. Weaste Hotel, Salford. 7.15 p.m. General meeting. 8 p.m. Social evening and concert.

Institution of Post Office Electrical Engineers.—Tuesday, December 14th. Institution of Electrical Engineers, London, W.C.2. 5.30 p.m. "Impulsing Aspects of Automatisation." Messrs. W. E. Chinn and H. O. Ellis.

Institution of Civil Engineers.—Wednesday, December 15th. Institution, London, S.W.1. 6 p.m. Informal meeting. "Electrical Peak Loads and Methods of Dealing Therewith, with Special Reference to Hydraulic Storage." Mr. R. W. Mountain.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdare.—December 13th. U.D.C. Electric lighting, heating, wiring and equipment at new clinic and offices, Rock Grounds. Engineer and Surveyor's Office, Town Hall.

Aberystwyth.—December 21st. Electricity Department. E.h.v. and l.v. underground cables, distribution pillars and disconnecting boxes. (November 26th.)

Australia.—MELBOURNE.—January 11th. State Electricity Commission of Victoria. Aerial cable for one year. (T.Y. 28804/37.)*
January 18th. Cables. (T. 31312/37.)*
February 1st. Two 35,000-kVA transformers. (T. 31186/37.)*

Bradford.—December 14th. Education Committee. Heating and electrical installations at the new grammar school, Thornton. City architect, Town Hall.

Bristol.—December 20th. Airport Committee. Night flying equipment, consisting of boundary and obstruction lights, cable, wiring, jointing and control switches. Airport Manager's Office, Bristol Airport, Whitchurch.
December 29th. Port Authority. 15,000 yd. of e.h.v. cable at the Avonmouth and Royal Edward docks. (December 3rd.)

Bromley (KENT).—December 11th. Borough Council. 12-cwt. electric vehicle. (November 26th.)

Buxton.—December 21st. Borough Council. Extension of the e.h.v. transmission system by underground and overhead cables. (See this issue.)

Cannock.—December 18th. U.D.C. Electricity Department. Twelve months' supply of cables and meters. (December 3rd.)

Driffield (EAST YORKS).—January 11th. R.D.C. Electrically driven pumping machinery at the Hutton pumping station and the booster stations at Garton and Wetwang. (See this issue.)

Edinburgh.—December 17th. Commissioners of H.M. Office of Works. Domestic engineering service at new Government Offices, Calton site. Engineer, H.M. Office of Works, 122, George Street (deposit £1 1s.).

Epsom and Ewell.—December 28th. Electricity Department. L.v. cable. (See this issue.)

Fife.—December 14th. County Council. Electric lighting at school house, Guardbridge. G. Sandilands, county master of works, Property and Works Department, County Offices, Kirkcaldy (deposit £1 1s.).

Goole.—December 15th. Borough Council. Electrical and heating installations at a new Welfare Centre in Bartholomew Avenue. J. H. Castle, borough engineer, Municipal Offices (deposit £3 3s.).

Gravesend.—December 13th. Electricity Department. Meter testing apparatus and kiosk and switchgear. (December 3rd.)

Heston and Isleworth.—December 16th. Electricity Department. Glass bulb rectifier for the Wellington Road sub-station, Hounslow. (December 3rd.)

Kinghorn (FIFE).—December 13th. Town Council. Electric lighting at thirty houses. W. Williamson & Hubbard, architects, Kirkcaldy.

Kirkcaldy.—December 13th. Corporation. Electrical work at sixteen houses on the Oswald Road estate. Burgh surveyor.

Lancaster.—Electricity Department. E.h.v. pilot and medium voltage p.i., l.c., s.t.a. cables. (December 3rd.)

Leeds.—December 10th. Gas Department. Two 200-kW steam driven electric generating plants. (December 3rd.)
December 13th. Waterworks Committee. Electrically driven centrifugal turbine type pump, with a capacity of 700 gal. per min., complete with motor, switchgear, starter, &c. H. Shortreed, waterworks manager, Civic Hall.

Letchworth.—December 13th. U.D.C. Duplicate automatic electrically operated crude sewage pumping units, each to deliver 7,500 gal. per hr. Howard Humphreys & Sons, 17, Victoria Street, London, S.W.1 (deposit £2 2s.).

London.—ISLINGTON.—December 28th. Borough Council. Meter testing instruments. (November 26th.)
January 12th. Electrical and engineers' stores for one year. (December 3rd.)

Middlesex.—December 23rd. County Council. Electrical installation at the elementary school, Kenmore Park estate, Kenton. (November 26th.)

Newcastle-on-Tyne.—City Council. Electric lighting installation at the extensions to the Shotley Bridge Mental Hospital. City architect, 18, Cloth Market.

Newport (MON).—January 3rd. Corporation. Electrical installation at the Maindee Baths. (See this issue.)
December 14th. 18,000 electric lamps. Nichols Moore. borough electrical engineer.

New Zealand.—WELLINGTON.—February 8th. Public Works Department. 20,000-kVA transformer banks. (T.Y. 28531/37.)*
February 10th. Posts and Telegraph Department. Galvanised steel wire. (T.Y. 28843/37.)*

Northern Ireland.—BELFAST.—December 13th. Town Council. Electrically operated axial-flow type storm pumps, two to deliver 30,000 gal. per minute and two 20,000 gal. per minute of unscreened sewage; one auxiliary sump drainage pump, switchgear, overhead travelling crane, and associated works. City Surveyor's Department, Drainage Section (Room 90), City Hall (deposit £1 1s.).

Ogmore and Garw.—December 16th. U.D.C. Electricity Department. 630 yd. of 11,000-V, 3-phase cable, with l.v. cable to connect up to existing l.v. network, and one 150-kVA oil-cooled transformer, with 11-kV switch fuse isolator. (December 3rd.)

Oldham.—December 13th. Electricity Committee. P.i., l.c., l.v. cable and earthenware conduit. (December 3rd.)

Oxford.—City Council. Electrical installation in the new Isolation Hospital, Horspath. (See this issue.)

Portland.—December 27th. U.D.C. Cable, joint boxes and cover boards or tiles. (See this issue.)

Portsmouth.—December 14th. Electricity Undertaking. 11-kV overhead line, near Denmead, and one 11-kV pressure regulator at Horndean. (December 3rd.)

Rotherham.—December 11th. Transport Department. Four new trolley-bus chassis and bodies. T. P. Sykes, transport manager, Municipal Offices.

Rothes (MORAYSHIRE).—December 17th. Town Council. Electric street lighting equipment for the town. A. L. Falconer, town clerk, 54, High Street, Elgin.

Sheffield.—January 10th. Electricity Committee. Natural draught cooling tower. (See this issue.)

Smethwick.—Education Committee. Electric lighting, power, clocks and bells in existing schools. (December 3rd.)

South Africa.—PRETORIA.—December 23rd. Public Works Department. One 150-kVA, three-phase transformer, one h.v. and one l.v. switch and underground cable. (T.Y. 28446/37.)* L.v. switches and transformer. (T.Y. 28447/37.)*
December 30th. One 50-kVA transformer, with h.v. and l.v. switches. (T.Y. 28691/37.)*
December 23rd. Union Tenders and Supplies Board. Power equipment for the Bloemfontein carrier repeater station. (T. 28451/37.)*
RICHMOND (CAPE PROVINCE).—January 10th. Municipality. Plant, equipment and materials for power station and distribution network. (T.Y. 28556/37.)*
BLOEMFONTEIN.—January 3rd. Electric Supply Department. E.h.v. and h.v. switchgear, three 500-kVA and three 250-kVA transformers and p.i., l.c. cable. (T. 28916/37.)*
KRUGERSDORP.—January 3rd. Electricity Department. Four three-phase, oil-filled, indoor type transformers. (T. 28932/37.)*
JOHANNESBURG.—January 24th. Railways and Harbours Administration. One 90-ft. electrically driven turntable, complete with motor. (T.Y. 28930/37.)*

Southport.—December 13th. Town Council. Water heating installation and electric lighting, power, telephones, clocks and special fire station equipment, &c. (November 26th.)

Swinton and Pendlebury.—December 20th. Borough Council. Electrical installation at open-air school. H. Bennett, architect, 1, Chester Terrace, Regent's Park, London, N.W.1.

Wallasey.—January 18th. Borough Council. P.i., l.c. cables. (See this issue.)

West Riding.—County Education Committee. Renewal of electrical installation at South End Council school, Elland. J. H. Crabtree, divisional clerk, Allan House, Sowerby Bridge.

Wolverhampton.—January 1st. Corporation Water Undertaking. Electrically driven pumping plant, comprising duplicated river, well and forcing sets of 13-, 75- and 337-w.h.p. each, and driven by variable-speed l.v. and h.v. a.c. motors, together with transformers, switchgear, cranes, &c., for the Cosford waterworks reconstruction. Water engineer and manager, Town Hall (deposit £2).

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Birkenhead.—Electricity Committee. Accepted. Electrical installations in twenty-eight houses (£120).—Park Electrical Co. Switchgear.—G.E.C. (£269); W. Lucy & Co. (£210); Switchgear & Cowans (£1,289).

Blackburn.—Electricity Committee. Accepted. Switchgear at the British Northrop Loom Co.'s sub-station.—A. Reyrolle and Co.
Town Council. Accepted. Switchgear in connection with the electricity supply to the new factory of Philips Lamps, Ltd.—A. Reyrolle & Co. 155-kW electrode boiler for heating the new Electricity Offices, Jubilee Street (£1,550).—Bastian & Allen.

Blackpool.—Libraries Committee. Accepted. Electrical installation at Hawes Side Lane library and clinics.—J. W. Fielding & Co.
Gas Committee. Accepted. Generating sets for new gasworks at Marston.—Belliss & Morcom.

Cardiff.—Electricity Committee. Accepted. "Partridge Wilson" electric vehicle (£390).—W. Lewis & Sons. Switchboard (£271).—Ferguson, Pailin. Testing equipment.—W. Lewis and Sons; Weston Instrument Co.; McWhirter, Ltd.; Met.-Vick. Elecl. Co.; Cambridge Instrument Co.; Zenith Electric Co.

Consett.—U.D.C. Accepted. Electrical installation in twenty houses at Leadgate.—J. H. Bell.

Leeds.—Electricity Committee. Accepted. Cables.—Henley's (£1,539); Enfield Cable Works (£1,552); Edison Swan Cables (£873); Crompton Parkinson (£486); Connolly's (Blackley) (£405); Hackbridge Cable Co. (£369).
Markets Committee. Accepted. Electric lighting at omnibus station (£541).—N. G. Bailey & Co.

Notes

E.P.E.A. Dinners

Proposing the toast of the "Electrical Power Engineers' Association" at the annual dinner of the Scottish Division in Edinburgh last Saturday, Mr. J. Cameron Smail (Principal, Heriot Watt College) said that to an outsider there was nothing more amazing in the history of the country than the growth of electrical undertakings. He had looked through the figures of 61 municipal authorities for the past year and found that 60 had increased their outputs by an average of 15 per cent. Mr. H. J. Cox (president, E.P.E.A.), in responding, referred to the educational aspects of the Association's work and to the success of the Whitley Council in the electricity supply industry. Mr. H. C. Babb (general manager, Lothians E.P. Co.) replied for the guests.

Mr. A. Ellis, former chief of the electricity and transport undertakings of the Cardiff Corporation, criticised the proposals for the reorganisation of electricity distribution, which he described as an attempt at nationalisation of the electricity supply industry, at the annual dinner of the South Wales Section of the Western Division of the Electrical Power Engineers' Association, held at the Park Hotel, Cardiff, on December 2nd. He said that it was only in the case of an industry which was particularly successful that the Government stepped in and interfered. Mr. L. Howles (manager, South Wales E.P. Co., Ltd.), said that in their industry the process of evolution was better than revolution. Mr. A. Nichols Moore (borough electrical engineer, Newport), who proposed the toast of "The Association," said that the proposed reorganisation of electricity distribution would impose a great deal of work upon the Association, and it should be prepared for drastic proposals in the New Year, although they would not take effect for some time. Mr. H. J. Cox (national president), in responding said that the Association was doing all it could to raise the status of the engineer and to make him more fit to receive the salaries it had negotiated for in the N.J.B.

Consulting Engineers

There was an attendance of close on 200 at the annual dinner of the Association of Consulting Engineers on December 2nd at St. Stephen's Club, S.W., Mr. H. P. Hill (chairman of the Association) presiding. The toast of "His Majesty's Ministers" was proposed by Sir Alexander Gibb, who stated that the consulting engineer—one who was neither an agent nor a salesman and who could give advice without bias—was a peculiarly British institution. In national emergency, the Government could rely on the help of the Association in preventing the misuse of man power. Response was made by Sir Thomas Inskip (Minister for the Co-ordination of Defence), who expressed appreciation of the indispensable part played by engineers in rearmament. Brig.-Gen. Sir Harold Hartley, replying to the toast of "The Guests," proposed by Mr. A. C. Dean, who had referred to the "code of self-immolation" imposed on consulting engineers in eschewing publicity, touched upon the danger to civilisation due to over-specialisation. Rationalisation, he said, had at least reduced litigation. The Hon. Mr. Justice Langton, proposing "The Association of Consulting Engineers," mentioned that that body was now twenty-seven years old and drew attention to the work of the consulting engineer in giving expert evidence as well as in consultation. In response the chairman dwelt on the responsibility of the engineer to use the work of the scientist and, while not ruling out experiments, to consider reliability first. The expense of expert advice might be far less than that incurred through the mistakes of enthusiastic amateurs.

Landowners and Supplies

In the House of Commons on December 2nd, Mr. Quibell asked the Minister of Transport whether he would take powers to compel landowners to permit the introduction of electricity to the houses and villages on their estates when such landlords had, without giving reasons, refused to permit such introduction. Mr. Burgin said that his attention had been drawn to a case where such a position had arisen, but he had no evidence that such cases were of frequent occurrence or that legislation to deal with them was necessary.

Queen Mary College

Founded in 1887 as a technical school in connection with the People's Palace in the Mile End Road and recognised in 1907 as a school of the University of London, Queen Mary College commemorates its jubilee this week. Since receiving its royal charter of incorporation in 1934, when its name was changed from East London College, the old buildings have been remodelled and the erection of a new block has been started on the old Winter Garden site. Among the modifications made are the rebuilding of the electrical engineering department and the enlargement of the civil and mechanical engineering departments. Work in hand includes a much needed extension of the physics department and the provision of new rooms for the students' union and a new college hall. The number of students at present is about 500, a quarter of whom are in the faculty of engineering (the Dean of which is Prof. E. H. Lamb). Arrangements are made for selected students to spend their long vacations in the later stages gaining practical experience in the Stepney Corporation undertaking and in the works of the B.T.H. Co., the Met.-Vick. and the Steatite & Porcelain Co. While the electrical department is well equipped for study in the ordinary way, its most notable feature is the high-voltage laboratory—the first of its kind in a British university. It was constructed after the head of the department, Professor J. T. MacGregor-Morris, had visited seventeen institutions in the United States, and the reader in electrical engineering, Mr. W. J. John, who had specialised in high-voltage work, had spent twelve months investigating similar laboratories in Germany. The plant was put into commission last year and its technical details were described in the ELECTRICAL REVIEW of May 8th, 1936.

High-voltage Oil-filled Cable

The order placed by the Dutch authorities for 56 miles of Pirelli oil-filled cable for the 150-kV interconnector between Rotterdam and The Hague follows a series of successful tests carried out at the K.E.M.A. laboratories in Holland. This is, however, not the highest voltage for which cable of this type has been constructed, as 34 miles has been in operation continuously at 220 kV in Paris since April of last year and forms part of the transmission system between the city and the Kembs water-power plant on the Rhone. It is the only commercial installation anywhere, Pirelli-General Cable Works, Ltd., state, that is in operation at the voltage. The decision to adopt oil-filled cable was due to the success obtained with an original length of just over half a mile that was installed in September, 1932, at Cislago, near Milan, in series with a 220-kV line.

International Congress at Glasgow

A number of engineering societies are to co-operate in organising an International Engineering Congress in Glasgow during the period of the Empire Exhibition. Lord Weir has been elected chairman of a representative committee for the purpose. It is proposed that the Congress shall be held from June 21st to 24th, the general arrrangements being as follows:—

June 21*st*.—Opening session in the Conference Hall of the Exhibition, followed by technical session; visit to the Exhibition; and civic reception.
June 22*nd*.—Technical sessions; visit to Exhibition or works.
June 23*rd*.—Excursions.
June 24*th*.—Visits to works; reception and conversazione.

Membership will be open to members of any recognised technical society. The Congress fee will be £2 5s. (accompanying ladies £1 15s.), and will cover attendance at the Congress, excursions, receptions, &c., admission to the Exhibition and volume of proceedings. A detailed programme is being prepared and will be circulated. The hon. general secretary of the Committee is Mr. P. W. Thomas, 39, Elmbank Crescent, Glasgow, C.2.

Colour Television

The reproduction of pictures made up of blue, green and red lines in sequence is reported to have been carried out by Mr. J. L. Baird, who has used mechanical scanning for the purpose. He considers, however, that similar effects will be obtainable in the future on a cathode-ray screen.

Trunk Road Lighting

In the House of Commons on December 1st, Mr. Lyons asked the Minister of Transport whether he would indicate where and to what extent illumination of main roads had already been undertaken under the provisions of Section 6 (4) of the Trunk Roads Act, 1936. Mr. Burgin said that he had not yet exercised his powers under this sub-section, but would shortly notify local authorities that, where they considered that portions of trunk roads should be illuminated or better illuminated to standards which conformed reasonably with those recommended for traffic routes by the Departmental Committee on Street Lighting, he would, in certain circumstances, be prepared after April 1st, 1938, to enter into agreements with them whereby he would contribute 50 per cent. of the capital cost and 50 per cent. of the annual cost of maintenance.

Appointments Vacant

Commercial assistant for Kingston-on-Thames Electricity Department.

Assistant mains engineer for Eastbourne Electricity Department.

Installation and meter inspector for Salisbury, S. Rhodesia.

Electrical engineers for the Sea Insurance Co., Ltd.

Engineer for Hillingdon County Hospital and Institution.

Meter test room superintendent for the Scunthorpe Electricity Department.

(See our Classified Advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

JANETTE rotary convertor.
EARBY'S commutator cement.
ELLERSTYLE baker's oven lamp.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

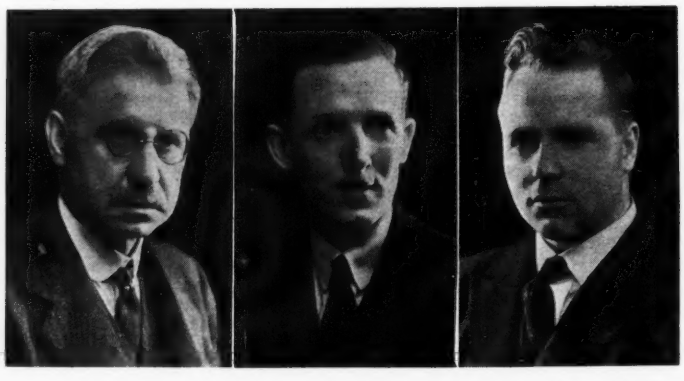
Arrangements are being made for a dinner to be given in honour of **Mr. J. W. Beauchamp**, who recently retired from his post under the Central Electricity Board. It will take place at the Waldorf Hotel, London, on Tuesday, January 11th, and is open to any who wish to attend. Tickets (price 25s. each) can be obtained on application to the Director and Secretary, Electrical Development Association, 2, Savoy Hill, London, W.C.2.

Mr. H. S. Lewis, A.M.I.Mech.E., who for many years represented Richardsons Westgarth & Co., Ltd., in the Midlands, and has been in charge of their London office since 1933, has recently been appointed director of Richardsons Westgarth-Brown Boveri, Ltd.

Manchester Corporation Electricity Committee has passed a resolution of appreciation of the services rendered to the department by **Mr. J. G. Thomson**, boiler-house engineer, Stuart Street power station, upon his retirement on reaching the age limit.

Mr. F. O. Duckworth, chief assistant with the Haslingden Corporation Electricity and Transport Department, has been presented with a silver-plated cakestand and hot-water jug from the employés to mark the completion of twenty-five years' service with the Department.

Mr. R. C. Harpur, who recently retired from the position of borough electrical engineer at Dover, has been presented by the Mayor, on behalf of the staff of the Electricity Department, with a Westminster chimes clock and an illuminated address bearing the names of all those in the undertaking.



[Commercial Studios

Mr. T. Birkett **Mr. R. Mackay** **Mr. A. Wynn**

Mr. D. J. Bolton, M.Sc., has been elected a member of the London and Home Counties Joint Electricity Authority as one of the six representatives of the London County Council.

Mr. T. Duerden

Mr. T. Duerden, B.Sc. (Tech.), A.M.I.E.E., who is on the staff of the Blackburn Corporation Electricity Department, has been appointed technical assistant to Mr. R. H. Harral, the borough electrical engineer. Before going to Blackburn Mr. Duerden was with the Nelson Corporation electricity undertaking, and previously he was with Crompton Parkinson, Ltd.

Mr. H. Brooks, senior assistant mains engineer at the Salford Corporation electricity works, has been appointed to fill the vacancy caused by Mr. Duerden's promotion.

Miss W. M. McInnes, daughter of Mr. C. F. McInnes, electrical engineer to Gravesend Corporation, has resigned from the post of chief clerk in the Corporation Electricity Department after twenty years' service owing to her forthcoming marriage. Miss McInnes has been secretary of the Gravesend Branch of the E.A.W. since its formation in 1933 and has been presented with a silver teapot, water jug and tray as a wedding gift from the members. She has also received an illuminated address and a floor lamp standard from her colleagues in the Electricity Department.

Mr. C. H. De Nordwall, A.M.I.E.E., is resigning his position with the Metropolitan-Vickers Electrical Co., Ltd., at the end of January to take up an appointment with the British Electrical Development Association. He will be responsible for development work in connection with power applications. Mr. Nordwall received his early training at Faraday House and was apprenticed to Fraser & Chalmers Engineering Works, Erith, and the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park. He spent several years in Nigeria as chief engineer to the Northern Nigeria (Bauchi) Tin Mines. He was also for a considerable time in Russia in the capacity of an erection engineer for Metropolitan-Vickers, he was one of the "defendants" in the 1933 Moscow trial. Since 1933 he has been attached to the Sales Department of the London office of Metropolitan-Vickers.

[Elliott & Fry.

Mr. C. H. De Nordwall

Mr. T. Birkett, general manager of the Midland Electric Manufacturing Co., Ltd., is retiring from that position at the end of the current year. He will, however, remain on the board of the company. The position of general manager will be filled by **Mr. A. Wynn**, who has for some years acted as assistant general manager, and is a director of the company. **Mr. R. Mackay** will undertake the duties of sales manager, having been connected with that branch of the company's organisation for the past ten years.

Captain T. Kerr-Jones, M.I.E.E., mechanical and electrical engineer, Directorate of Works, Air Ministry, has retired on reaching the age limit. He received his training at the City and Guilds Technical College, Finsbury, and in the workshops and test room of Siemens Brothers & Co., Woolwich, later serving as a member of the engineering staff. After specialising on tramway work for a year at the Preston works of the English Electric Manufacturing Co. (later Dick, Kerr & Co.) he joined the General Electric Co., serving on the head office staff and at the Manchester works. In 1905 he set up in practice as a consulting engineer in Victoria Street and was engaged in this up to the outbreak of war, when he accepted the appointment of Chief Electrical Engineer to the War Department Supervising Engineers responsible for all new constructional work in the Southern and the Irish Commands. Having brought the mechanical and electrical work practically to completion, he was commissioned in the Royal Flying Corps, transferred on amalgamation to the Royal Air Force and was offered early in 1920 the civilian post in the Air Ministry in which he has continued to serve up to the date of retirement. Captain Kerr-Jones, as a member of Council of the National Illumination Committee of Great Britain, represented the Ministry on various international commissions; he also served on a number of British Standards Institution committees. His colleagues in the Directorate of Works presented him on retirement with an all-wave radio receiver and a silver tankard, suitably inscribed.

Ald. H. K. Beale was re-appointed chairman of the South-West Midlands Advisory Joint Committee at a meeting held on December 6th. Ald. Beale has held this position since the Committee was established in June, 1923.

At the ordinary meeting of the Institution of Electrical Engineers on December 16th, an oil painting of **Mr. Sydney Evershed**, by George Harcourt, R.A., will be presented to the Institution. The painting was subscribed for by the many business associates and admirers of Mr. Evershed, to commemorate the fiftieth anniversary of his entry into the electrical industry, and it will be formally presented, on their behalf, by Lieut.-Col. W. A. Vignoles, D.S.O.

Mr. G. S. Bone has resigned from the position of sales manager to the Borough of Brentford and Chiswick in order to take up the appointment of publicity manager to Pressed Steel Co., Ltd., Refrigerator Division. Mr. Bone has been actively associated with electricity supply during the past twelve years, having held previous appointments with the Ealing, Barrow-in-Furness, and Scunthorpe Corporations and

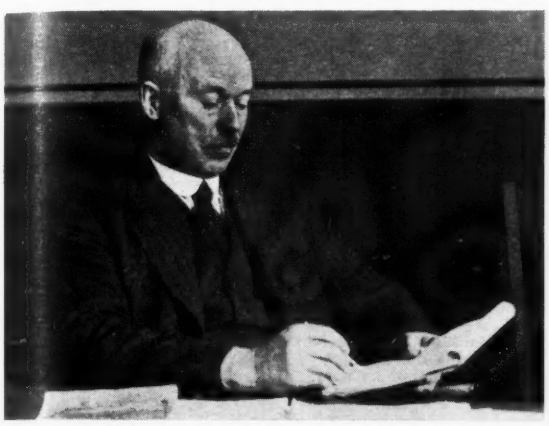
the Gainsborough Urban District Council. He is leaving the London area to take up residence at 42, Salisbury Crescent, Summertown, Oxford.

Mr. T. S. Andrew, A.M.I.E.E., who has been on the technical staff of the South-East and East England Districts of the Central Electricity Board since 1931, has been appointed technical engineer for the South-West England and South Wales District. He received his technical training at Faraday House and afterwards was on the staff of A. Reyrolle & Co., Ltd., for eight years.

Mr. A. L. Fielding, Assoc.M.Inst.C.E., A.M.I.E.E., M.Inst.F., has been officially gazetted advisory and inspecting engineer for the New South Wales Government in London. The appointment is to date from July, 1931, when he succeeded the late Mr. J. Davis, M.Inst.C.E., who had previously performed the duties as private practice.

Mr. L. Breach, chief electrical assistant with the Liverpool Corporation Electric Power and Lighting Department, has retired after thirty-two years' service, and he has received a presentation from members of the staff. Mr. Breach, who has served as assistant electrical engineer, engineering assistant, senior engineering assistant, and chief electrical assistant, proposes to make an extensive tour, embracing visits to Bermuda, Havana, Los Angeles, San Francisco and New York.

Mr. W. J. Howard, mains engineer with the Sheffield Corporation Electricity Department, has retired after forty-eight years' service with the Corporation. On November 27th he was entertained by the senior staff of the Electricity Department to a complimentary dinner, and on November 30th he and Mrs. Howard were guests at a smoking concert attended



Mr. W. J. Howard

by the staff and employés of the undertaking, at which Mr. J. R. Struthers, the general manager and engineer, presented them with gold watches subscribed for by the staff. Mr. Struthers read a telegram of good wishes from Mr. S. E. Fedden, the former electrical engineer at Sheffield, and expressed his appreciation of Mr. Howard's technical qualities. Mr. Howard, in responding, mentioned that he started work with the old electricity supply company at the age of seventeen.

Mr. J. Harvey, consumers' engineer with the Bedford Corporation Electricity Department, is retiring after forty-two years' service.

Obituary

Mr. J. Hetherington.—We regret to announce the death, which occurred on December 1st at the age of eighty-one, of Mr. Joseph Hetherington, M.Inst.C.E., a pioneer in cable-laying. He was born in Cumberland and his forebears had been farmers from the fifteen-hundreds. He was a farm hand for a time until he was seventeen years old, and then served an apprenticeship in Armstrong's Ordnance Works, Newcastle, later dealing with locomotives and marine engines as a fitter. He was in charge of a pumping station in the Thames Valley for some years, and in 1899 was engaged on the engineers' staff of the London Electric Supply Corporation as superintendent of works. The late Mr. S. Z. de Ferranti engaged him, although it was made clear that Hetherington had no knowledge or experience of electrical work, but his character was such that Mr. Ferranti preferred his mechanical knowledge and commonsense, and said that he could provide electricians competent to look after the testing and other electrical essentials. In this way Mr. Hetherington was put in charge of, among other things, the laying of the 10,000-V tubular mains from Deptford to London. (It may not be generally known that some of these mains continued to function until November, 1933, when an alteration in the frequency caused them to be scrapped, although still in good working order.) At the end of this work he was invited to become contracts manager to W. T. Glover & Co., Ltd., for whom he designed the joint-boxes and supervised the laying of their cables for about three years. He then went to the British Electric Transformer Co. and designed and built their new works at Hayes in about 1900. In his later years, through unlucky investments, he had to take up work again, and became the chief engineer to Whiteley Village, near Walton-on-Thames, from which post he retired two or three years ago. He was buried at Hersham on December 4th. He was a widower and without children.

Mr. W. H. Meadowcroft, whose death at Boonton, New Jersey, is reported, was an assistant and confidential secretary of the late Thomas Alva Edison, with whom he served for fifty years. The *Telegraph and Telephone Age* states that Mr. Meadowcroft, who was born at Manchester, England, in 1853, made some modest contributions of his own in the electrical world. He was the first exploiter of the miniature electric lamp; the originator of the application of electricity to display signs; and an early experimenter with X-ray. He was the author of "The A.B.C. of Electricity" (1888); "The A.B.C. of the X-ray" (1897); "The Boys' Life of Edison" (1911 and 1928); and a collaborator with Dyer and Martin on "Edison: His Life and Inventions" (1911 and 1929).

Monsieur E. Buffet.—The death is reported from Paris, France, at the age of seventy-one years, of Monsieur Ernest Buffet, the chief engineer of the Compagnie Parisienne de Distribution d'Electricité. He had for many years served on electrical committees in France.

Mr. E. Bolton.—We regret to record the death of Mr. E. Bolton, A.M.I.E.E., who for the past thirty-six years had been sub-stations engineer to the Manchester Corporation Electricity Department. He was taken ill and died while travelling to his office on Tuesday morning last. Mr. Bolton, whose loss will be severely felt, was fifty-eight years of age, and prior to his appointment to Manchester in 1901 he served with the Dublin United Tramways Co., the British Thomson-Houston Co., Ltd., and the Central London Railway. The growth of the distribution system which was under his supervision at Manchester may be gauged from the fact that in 1901 there were only seven supply sub-stations, and there are now 371.

Mr. J. W. Geddes.—We regret to announce the death of Mr. John William Geddes, which occurred at his home at New Malden on November 29th. Mr. Geddes acted for a number of years as technical director to Westool, Ltd., and in this capacity developed many of the company's specialities. He was associated in his early days with Armstrong, Whitworth & Co., Ltd., Platt Bros., of Oldham, and, later, with important firms on Tyneside, and his death will be regretted by a large circle of friends in all parts of the country.

Mrs. Graseby.—We regret to state that Mrs. M. M. Graseby, wife of Mr. R. C. Graseby, M.I.E.E., managing director of Venner Time Switches, Ltd., died on Sunday last. We join with Mr. Graseby's many friends in sympathising with him in his bereavement.

Mr. G. Ness.—The death occurred on December 5th of Mr. George Ness, M.I.Mech.E., M.I.M.E., M.I.E.S., F.Inst.F., formerly chief engineer and general manager, Scottish Boiler & General Insurance Co., Ltd.

New Books

Kempe's Engineer's Year Book, 1938. Edited by L. ST.L. PENDRED. Pp. 2,816. London: Morgan Brothers (Publishers), Ltd. Price 31s. 6d.

The forty-fourth annual edition of this publication, which is in constant use by engineers and scientists all over the world and covers the whole field of present-day engineering knowledge and practice, has been considerably revised and several new sections have been added. The descriptive sections containing particulars of the products of many important engineering firms have also been extended. For the sections on Electrical Engineering and Electric Traction Professor S. Parker Smith has been responsible, and for that on Radio Communication the editor of *The Wireless World*, while Mr. W. J. Jones deals with Lighting. There are also extensive references to electrical practice under other headings. The book is well illustrated and has a very complete index.

Law Relating to Electrical Energy in India and Burma. By J. W. MEARES. (Fifth edition.) Pp. 477. London: W. Thacker & Co. Price 27s.

Since the appearance of the fourth edition of this useful manual in 1933 the control of electricity supply in India has been affected by the Government of India Act, 1935, under which it becomes the concern of both the Central and the Provincial Governments. In addition, certain specific amendments have been made in the Indian Electricity Act; the sections relating to rules have been entirely recast by the Indian Electricity (Amendment) Act, 1937, which sets up a "Central Board" for the purpose. All the amendments made as a result of the constitutional changes and by the Amendment Act are fully dealt with by Mr. Meares, and the Indian Electricity Rules, 1937, are given *in extenso* in an appendix to the book.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Lancashire Cables, Ltd.—Private company. Registered December 3rd. Nominal capital, £120,000 in £1 shares (60,000 "A" and 60,000 "B"). Objects: To carry on the business of electric cable makers, foundrymen, metal workers, constructional, hydraulic, electrical and general engineers, &c. The directors are: R. P. Floyd (deemed to have been appointed by "A" shareholders); and A. A. Bottomley (deemed to have been appointed by "B" shareholders). Solicitors: Strong & Co., 61/2, Gracechurch Street, E.C.

Electrical Test Laboratories, Ltd.—Private company. Registered December 4th. Capital, £5,000. Objects: To carry on the business of designers, manufacturers, factors, exporters, importers, and merchants of and dealers in radio, television and electrical apparatus, precision, testing and analysing instruments, &c. The directors are: W. G. Dick-Larkam (permanent), address not stated; and H. Grahame-Richards, Brent Lodge, Finchley Way, N.3. Solicitors: Evershed & Son, 40/43, Chancery Lane, W.C.2.

Brush Crystal Co., Ltd.—Private company. Registered December 4th. Capital, £10,000. Objects: To acquire the business carried on at Woodbridge House, 49, Clerkenwell Green, E.C., by the Brush Development Co., and to carry on the business of cutters and manufacturers of and dealers in crystals and crystal units possessing piezo-electric properties, and apparatus of all kinds embodying such crystals or crystal units, dealers in or repairers of electrical or chemical appliances and goods, &c. The subscribers are: L. D. Smith, 19, Court Lane Gardens, Dulwich Village, S.E.21; W. T. Williams, 70, Exeter Road, Southgate, N.14; and J. C. Parham, 17, Ascot Road, Tooting Junction, S.W.17. The Brush Development Co. shall be entitled, while holding any shares, to have a nominee on the directorate, who shall not require any qualification. Solicitors: Bircham & Co., 100, Old Broad Street, E.C.

Prompt Electric Service, Ltd.—Private company. Registered December 4th. Capital, £1,000. Objects: To carry on the business of electrical, lighting, heating, wireless, television, mechanical and general engineers, &c. The directors are: R. H. Law, Fairfax Road, Leicester; H. G. S. Mason, Edgehill, Letchworth Road, Leicester; and A. T. Wilson, 38, Osmaston Road, Leicester. Solicitors: Freer & Co., 10, Mew Street, Leicester.

K. Chiba & Co., Ltd.—Private company. Registered November 29th. Capital, £500. Objects: To acquire the business of a manufacturers' agent, &c., carried on by Kaichi Chiba at 13, Fitzroy Street, Fitzroy Square, W., and to carry on the business of designers, manufacturers, importers and exporters of and dealers in lampshades and screens, bowls, globes and the like for use in connection with electric or any other method or system of lighting, &c. The subscribers are: W. R. Furby, St. Helier, 13, Halstead Road, Winchmore Hill, N.21; and T. Yamanouchi, Claremont House, St. Mary's Terrace, W.2. The directors are: K. Chiba and S. Giltrow, addresses not stated. Secretary, T. Yamanouchi.

Conflu, Ltd.—Private company. Registered December 1st. Capital, £10,000. Objects: To acquire certain inventions of Fritz A. M. Heppner relating to improvements in torque or power transmitting mechanism and in hydraulic torque convertors, and to carry on the business of mechanical and electrical engineers, manufacturers of machinery, &c. The directors are: G. T. Willcox, Headingley, Cobham, Surrey; H. Daniels, 8, Guilford Place, W.C.1; Fritz A. M. Heppner, 219, Hampstead Way, N.W.11; and E. Wilshin, 2, Ashbourne Close, Ealing. Registered office: Friars House, 39/41, New Broad Street, E.C.2.

Cleco Electric Industries, Ltd.—Private company. Registered November 30th. Nominal capital, £20,000. Objects: To acquire all or part of the assets and undertaking of Clecolectric Vehicles, Ltd., and all or any trade marks, trade names (including the registered trade name "Cleco"), and other rights in connection therewith, and to carry on the business of manufacturers of and dealers in electrical equipment, vehicles, accumulators, batteries, dynamos and appliances, electricians, mechanical engineers, &c. The subscribers are: G. H. Woodcock and F. E. Farres, both of 2, Bond Court, Walbrook, E.C.4. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C.4.

Mitchell Electric Co., Ltd.—Private company. Registered November 29th. Capital, £3,000. Objects: To carry on the business of electrical and mechanical engineers, lighting, heating and refrigerating engineers, iron and brass founders, &c. The subscribers are: J. G. S. Mitchell, "Elmfield," Woodfalls, Salisbury, Wilts; and W. R. M. Mitchell, 28, Knightlow Road, Harborne, Birmingham. Secretary: T. B. Vincent. Registered office: Meco Works, Wheeleys Lane, Five Ways, Birmingham.

Weir Electrical Instrument Co., Ltd.—Private company. Registered November 24th. Capital, £2,000. Objects: To carry on the business of manufacturing electrical and radio instruments, metal piercers, turners and moulders, &c. The directors are: I. A. Currey (permanent), 41, Pickwick, Corsham, Wilts; and J. Grant, Murhill Corner, Winsley, Wilts. Registered office: Greenland Mills, Bradford-on-Avon, Wilts.

R. G. R. Salons, Ltd.—Private company. Registered December 2nd. Capital, £1,000. Objects: To carry on the business of buyers and sellers, importers and manufacturers of, agents for and dealers in electrical and radio apparatus, television apparatus, &c. The subscribers are: H. W. Brown, 72, Felstead Road, Orpington, Kent, and C. J. Knight, 170, Lower Road, S.E.16. Registered office: 20, Hanway Street, W.1.

North-West Electrical Co., Ltd.—Private company. Registered November 29th. Capital, £100. Objects: To carry on the business of wholesalers, retailers and manufacturers of and dealers in radio, electrical and sports goods, &c. The directors are: J. Cook, 30, Chatsworth Road, N.W.2; and L. F. Butcher, 4, Dunster Gardens, N.W.6. Registered office: 328E, Kilburn High Road, Brondesbury, N.W.6.

Returns of Electrical Companies

Keighley Electrical Engineering Co., Ltd.—Capital, £10,000 in 3,000 preference and 7,000 ordinary shares of £1. Return dated October 5th, 1937. 2,300 preference and 4,256 ordinary shares taken up. £4,544 paid on 1,900 preference and 2,644 ordinary shares. £2,012 considered as paid on the remainder. Mortgages and charges, £7,250.

Kalee, Ltd.—Capital, £79,246 in 7,500 "A" preference, 61,250 "B" preference and 10,496 ordinary shares of £1. Return dated August 3rd, 1937. 6,215 "A," 61,250 "B," and 10,496 ordinary shares taken up. £20,695 paid. £57,266 considered as paid. Mortgages and charges, nil.

Genristo, Ltd.—Capital, £8,000 in 3,000 preference and 5,000 ordinary shares of £1. Return dated November 4th, 1937. 2,739 preference and 3,452 ordinary shares taken up. £6,239 paid. £2 calls unpaid. Mortgages and charges, nil.

Perak River Hydro-Electric Power Co., Ltd.—Satisfaction in full on July 31st, 1937, of trust deed dated February 25th, 1931, and registered February 26th, 1931. (Notice filed November 26th, 1937.)

Edward Wilcox & Co., Ltd.—Satisfaction in full on November 11th, 1937, of charge dated July 10th, 1937, and registered July 20th, 1937.

Mortgage on land and buildings at Sharston Road, Wythenshawe, Manchester, dated November 11th, 1937, to secure £4,666. Holders: Lord Mayor, aldermen and citizens of Manchester.

T. H. Satchwell, Ltd.—E. P. Major, of 89, Cornwall Street, Birmingham, ceased to act as receiver on November 22nd, 1937.

Ellis & Mort, Ltd.—Capital, £20,000 in £1 shares. Return dated September 17th, 1937. 15,000 shares taken up. £10,120 paid. £4,880 considered as paid. Mortgages and charges, nil.

W. Mackie & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated October 14th, 1937. 7,500 shares taken up. £3,155 paid. £4,345 considered as paid. Mortgages and charges, nil.

Rediffusion, Ltd.—Capital, £10,000 in £1 shares. Return dated July 2nd, 1937. All shares taken up. £100 paid. £9,900 considered as paid. Mortgages and charges, nil.

Dalgetti Electric, Ltd.—Capital, £500 in £1 shares. Return dated September 10th, 1937. 150 shares taken up. £150 considered as paid. Mortgages and charges, nil.

Kniveton Cable Works, Ltd.—Satisfaction in full on November 12th, 1937, of debentures authorised by resolutions of January 24th, April 5th and September 5th, 1934, and registered February 8th, July 24th and October 5th, 1934, securing £5,000.

Celtic Electrical Products, Ltd.—Debenture charged on land and buildings at Pontypridd and the company's undertaking and other property, present and future, including uncalled capital, dated November 29th, 1937, to secure £3,000. Holders: Special Areas Reconstruction Assn., Ltd., 5, London Wall Buildings, E.C.2.

Resistoid, Ltd.—Mortgage on Union Mill, Factory Brow, Middleton Road, Rhodes, Lancs, dated November 23rd, 1937, to secure £3,200. Holder: W. Collison, Rowsley Road, Lytham St. Annes.

Milliwatt Heating Pad, Ltd.—Particulars filed of £150 debentures authorised November 8th, 1937, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

E. H. Scott Radio Laboratories, Ltd.—The nominal capital has been increased by the addition of £14,900 beyond the registered capital of £100. The additional capital is divided into 59,600 ordinary shares of 5s. 47,800 shares were allotted for cash on November 16th, 1937, to Princes Street Nominees, Ltd.

Glyncieriog Electricity Supply Co., Ltd.—Capital, £1,500 in £1 shares. Return dated September 30th, 1937. 1,000 shares taken up. £1,000 considered as paid. Mortgages and charges, nil.

Donovan Electrical Co., Ltd.—Capital, £50,000 in £1 shares. Return dated November 5th, 1937. 29,100 shares taken up. £29,100 considered as paid. Mortgages and charges, nil.

Derby Cables, Ltd.—Capital, £200,000 in £1 shares. Return dated October 8th, 1937. All shares taken up. £200,000 paid. Mortgages and charges, nil.

Avenue Electric Co., Ltd.—Capital, £100 in £1 shares. Return dated August 26th, 1937. All shares taken up. £100 paid. Mortgages and charges, nil.

Scattergood & Johnson, Ltd.—Capital, £10,000 in 2,000 preference and 8,000 ordinary shares of £1. Return dated August 11th, 1937. 8,000 ordinary shares taken up. £1,252 paid. £6,748 considered as paid. Mortgages and charges, nil.

City Notes

Tube Investments, Ltd.—Presiding at the annual meeting held on December 1st, Mr. A. Chamberlain (chairman) said that the final figures constituted a record, the turnover having increased by 25 per cent. over the previous year, in spite of the fact that they had raised their prices very much less than the increase in labour and materials seemed to warrant. The first three months of the current financial year recorded a continuance of the increase in turnover over the corresponding period of 1937. This increase, however, was unlikely to continue at the same rate throughout the year, and it was even likely that the figures of the latter months of 1937 might not be reached. With regard to their other companies it was satisfactory to note that they all reported profits for the past year's working.

Electrical Apparatus Co., Ltd., reports a profit for the year ended August 31st, after providing for depreciation, income tax and N.D.C., of £19.164, against £16.511 in the previous year, to which is added £6.675 brought forward, making £25.839. A dividend on the ordinary shares of 5 per cent., less tax, is recommended and, after reserving £1,000 for depreciation and transferring £3,000 to general reserve, £14,431 is carried forward. The report states that offers have been made to the holders of all the preference shares of Bray, Markham & Reiss, Ltd., that were issued in 1928 in satisfaction of dividend arrears, to repurchase at par. The offers were accepted by the holders of 2,519 shares only. It is also stated that the company's factories were well occupied throughout the year and prospects continue satisfactory.

The Amazon Telegraph Co., Ltd., reports a gross profit for the year ended June 30th of £44,949, including payment of outstanding subsidy (against £14.887). Expenses were £23.051 (£25,148), leaving a profit of £21.898. After providing £563 for income tax and placing £12.000 to general reserve and £2,500 to reserve for renewal and maintenance of cable steamers, there is a balance of £6.835, which with £5,611 brought in makes £12,446. A dividend of 2½ per cent. is paid (against nil), and £7.758 is carried forward.

British Vacuum Cleaner & Engineering Co., Ltd., states that notwithstanding difficulties of production and increased costs incident to manufacture during the year to September 30th, a new record in the sale of "Goblin" cleaners has been established and the net profit has increased from £78.473 to £81,323. Depreciation of plant, premises, &c., takes £4,041 (£3,243), leaving £77,282, to which is added £12,154 brought forward, making £89,436. A sum of £5.736 is reserved for income tax 1938-39, making a total reserve of £12,500, and £2,000 is deducted for N.D.C. A final ordinary dividend of 30 per cent., less tax, making 40 per cent. for the year (same) is recommended, and after placing £25.000 to reserve, £8,450 is carried forward. The report states that the subsidiary company in Canada is making satisfactory progress and profit, no benefit of which has been taken into the above accounts.

Marco Refrigerators reports a profit for the year ended September 30th of £4,069, as compared with £1.302 in the previous year, to which is added £46 brought in. After providing for tax (£1.000), bad debt reserve (£500), and preliminary expenses (£2,500), there is a balance of £115.

The Compania Hispano-Americana de Electricidad has declared an interim dividend of 20 Argentine paper pesos in respect of shares of the series "A," "B" and "C," and 4 Argentine paper pesos in respect of the series "D" and "E." A similar distribution was made a year ago.

R. A. Lister & Co. report a trading profit of £204,142 for the year ended September 30th, an increase of £33,106 as compared with the previous year. After providing £4,972 for fees and pensions, £46,825 for income tax, £4,750 for N.D.C., £13.612 for preference dividend, and £25,309 for directors' commissions and staff bonus, there is a balance of £108,764. The ordinary distribution is 16 per cent., including a bonus of 6 per cent. (same), payable on £150.000 more capital, reserve receives £25,000, and £69,143 is carried forward (against £62,176 brought in).

The Associated Equipment Co., Ltd., reports a net profit for the year ended September 30th of £209.484, as compared with £223,063 in the previous year. Gross profits, after charging factory and other expenses, increased from £348.603 to £430,428, from which £120.000 (£60,000) is reserved for tax and £104,368 (£69,578) for depreciation. The dividend is maintained at 7½ per cent., tax free, and it is proposed to place £100,000 to reserve, against £85.000, thus leaving £260.000 to be carried forward, which includes a balance of reserve against a loan on mortgage of £8,016, no longer required. The annual meeting of the company was held on Monday last, when Mr. C. W. Reeve (chairman and managing director), who presided, said that the development of business in trolley-buses, produced in co-operation with the English Electric Co., Ltd., continued apace both at home and overseas.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., reports net profits for the year ended September 30th of £54,126, as against £66.137 for 1935-36, to which is added £16.126 brought in. The preferred ordinary dividend for the year is 8 per cent., and the ordinary dividend 9 per cent. (unchanged), the balance carried forward being £35.502. The report states that business has continued to be progressive throughout the year, although trading results have been adversely affected by exceptional expenses incurred in maintaining output during the transfer of a number of more important production departments to the new buildings. The greater part of the reconstruction programme has now been completed, but certain of the new shops will not be finally equipped and in occupation until early in 1938. Meeting: December 14th.

The Brazilian Traction, Light & Power Co. has declared a dividend of 50 cents per share on the ordinary shares of no par value. This compares with a payment of 40 cents a year ago, and, with the dividend of 50 cents paid in July last, makes a total of $1 for 1937, as against 70 cents last year. Payment of the dividend to non-residents of Canada will be subject to deduction of the Canadian income-tax of 5 per cent.

Yarrow & Co., Ltd.—At the annual meeting on December 1st, Sir Harold E. Yarrow, Bt. (chairman and managing director), said that the boiler department had been very busy with Yarrow boilers for important power stations at home and abroad, and this department was continuing to work at full capacity. Two of the six boilers for the new extension to the Dalmarnock power station, Glasgow, had recently been completed, and were in operation. This boiler installation represented one of the largest in Great Britain, and was the largest in Scotland, each boiler being capable of evaporating 200,000 lb. of steam per hour at a pressure of 625 lb. and at a steam temperature of 850 deg. F. The outlook for the immediate future was encouraging, and all departments would be fully occupied with orders for some time. During the last three years nearly 40 per cent. of the value of the total orders was for export.

Turner & Newall, Ltd., report net trading profits for the year ended September 30th, after providing for depreciation, directors' fees, and income tax, of £1,333,489, as compared with £1,163,308 in the preceding year, to which is added £99,069 brought in, making £1,432,558. Of this £40.000 is allocated to N.D.C. The final ordinary dividend is 16¼ per cent., making a total of 20 per cent. for the year on larger capital (against 17½ per cent.), reserve receives £100.000, and the pensions fund £10,000. A balance of £115,770 is carried forward.

The General Cable Manufacturing Co. reports a profit for the year ended September 30th of £22,401, an increase of £3,327 as compared with the preceding year. The final ordinary dividend is 7 per cent., making 13 per cent. for the year (against 10 per cent.). Reserve receives £6,000 and tax reserve £2,000, leaving £1,400 to be carried forward (against £1,248 brought in). Meeting: December 15th.

The Mid-Cheshire Electricity Supply Co., Ltd.—The Northwich correspondent of the *Financial Times* reports that the company is offering shareholders 300,000 4 per cent. cumulative preference shares of £1 at par and 100.000 £1 ordinary shares at 32s. 6d. The proceeds are to go towards repayment of the bank loan raised to allow the company to acquire a majority holding in the Mersey Power Co.

The Globe Telegraph & Trust Co., Ltd., has announced a quarterly interim dividend of 2s. 6d. per £10 share net or 1¼ per cent. (against 1 per cent.), making 2½ per cent. to date for the year to May 31st, 1938 (against 2 per cent.).

Gabriel Wade & English, Ltd., have declared a dividend at the rate of 6½ per cent. per annum, less tax, on the preference shares for the six months to November 30th.

The Electric & General Investment Co., Ltd., has announced an interim dividend of 2½ per cent. (same) on the ordinary stock.

Marconi's Wireless Telegraph Co. is paying a final dividend of 3½ per cent. on the 7 per cent. cumulative participating preference shares.

Greenwood & Batley have announced an interim dividend of 3 per cent. on the ordinary shares. No interim was paid last year, but the final distribution was 7 per cent.

Broom & Wade, Ltd., have declared a final dividend of 10 per cent., payable on capital increased in July last, making 22½ per cent. for the year (against 20 per cent.).

The Wellman Smith Owen Engineering Corporation, Ltd., has announced an interim dividend of 5 per cent. less tax.

Stocks and Shares

TUESDAY EVENING.

INTERNATIONAL complications show but little sign of becoming smoothed out, but one bright spot in the horizon is the more complaisant attitude recently adopted by President Roosevelt in connection with the States' relationship to utility and other American companies. The President would seem to be coming to a clearer perception of the damage which his policy has inflicted upon industry in the United States, and to be ready to take steps to repair it. In consequence, a brighter complexion has come over the American prospect, which, in its turn, affects a fairly wide circle of British interests. On this side, the reiterated assurances of Government and other highly placed authorities as to the soundness of our industrial condition now and for the next few years have helped to diminish the unpleasant effect produced last month by liquidation in Stock Exchange markets. But the rise in the unemployment figures came as an unpleasant disappointment and led to a renewed outbreak of dullness.

A feature this week in our lists is a substantial recovery in the price of Cable and Wireless ordinary stock upon talk of a possible proposal to alter the company's charter. Gilt-edged securities hold their previous levels. Despite the fact that window-dressing this year seems to be as popular as ever, there is, nevertheless, a fairly steady stream of investment support noticeable in many of the investment departments.

Cable and Wireless

This week's sharp recovery in the price of Cable and Wireless ordinary stock came as a welcome relief after its lengthy period of weakness. The jump of 5 points, to 66½, followed news of probable developments in connection with negotiations between the company and the Empire Governments. From these, some modification of the company's original charter is expected to result. The price of the stock had previously been engulfed in the wholesale fall of industrials; the quotation has fallen from over 80, at which it stood when the former "A" and "B" stocks were fused into one. Much of the drop can, of course, be accounted for by "general conditions," to the effect of which its free marketability made the stock particularly vulnerable.

Cable Traffic

A matter affecting still more closely the position of Cable and Wireless ordinary stock has been the trend of the monthly traffic index numbers, which have suffered from the variety of events making for contraction in the flow of international communications. Comparison of this year's traffic numbers with those of 1936 shows that the corresponding monthly figures are now nearer together than was the case in the opening months of the year, when the 1937 figures were anything up to 14 ahead of 1936. The gap has since narrowed, until at the present time activity is shown to be only fractionally above last year's October level. This course of events has naturally caused some disquietude, which, to judge from the movement in the ordinary stock, has been lightened as a result of the latest news. The price of Globe Telegraph ordinary was not affected by the raising of the interim dividend from 1 to 1¼ per cent.

Brazil Traction Surprise

The Brazilian Traction Company surprised and pleased its shareholders by declaring a dividend of 50 cents, which makes one dollar for the year, as against 70 cents in the preceding twelve months. On this, the price rose to 12¾. Profit-taking reduced it to 12¼, at which the gain on the week is ⅜. It may be recalled that Brazil Tractions were standing at 17½ a month or so back, a collapse in the price being caused by the calm announcement that the President of Brazil had seen fit to assume the rôle of Dictator. Other dollar issues are tolerably firm. American Telephone and Telegraph shares are up 2 points, to 149½. Internationals are 7⅛, after being 6¾.

Electrical Equipment Shares

Industrial markets make rather a mixed showing so far as the week's price movements are concerned. Among electrical equipment issues, Associated Electricals are up from 43s. to 45s., and General Electrics from 77s. to 78s. Elsewhere prices have generally been content to consolidate the improvement which has taken place since the collapse of a fortnight ago. Comparison of the lowest prices touched at that time with present levels testifies to the market's powers of resistance. General Electrics were down, at one time, to 67s. 6d., and Associated Electricals have been as low as 37s. Crompton Parkinsons, now 45s., have been up to 47s. 6d. In the case of Siemens, at 28s. 9d., and Crabtrees, at 27s. 9d., the advance is about half a crown. Brush ordinary recovered 2 points, to 24½, following publication of the results, which had apparently been awaited with undue pessimism. General Cables at 10s. were not affected by the report. Enfield Cables at 5⅞ and Lancashire Dynamos at 3⅞ are each ⅛ to the good.

Active Shares

A feature of the past week has been activity, at rising prices, in Westinghouse Brakes and Consolidated Signals. The former have risen from 56s. 6d. to 60s., and the latter from 5 to 5⅜, on hopeful dividend anticipations. The market is expecting distributions of 17½ per cent., against last year's 15 per cent., from the Westinghouse Company, and 35 per cent., against 30 per cent., from Consolidated Signal. A certain amount of bullish interest has centred round Allen Wests and Ismay Industries on rumours of amalgamations with larger concerns. Although altogether unconfirmed the reports have been accompanied by advances of about 1s. in the prices of both shares, which are now up to 6s. 9d. and 5s. 9d. respectively.

Mersey Power Preference

With investment still in no mood for taking undue risks, the demand for good industrial debentures and preference shares continues to keep pace with the supply. Among the not very extensive range of such issues on offer in the electricity markets is, at present, a line of Mersey Power 6 per cent. cumulative preference shares. The price is 28s. 3d., ex dividend, and the yield 4¼ per cent. The company serves an area of 100 square miles in the region of the River Mersey and the Manchester Ship Canal. Profits have risen over the last five years sufficiently to enable the dividend on the ordinary shares to be raised from 4 to 7½ per cent. The last-published profits covered the preference dividend about four times over.

The New Trusts

Market confidence has been given a buttress in the shape of three important trust companies announced to be in process of formation. The companies are to have a combined capital of 4½ million pounds, and will be under auspices well respected in the City. It is not only the small investor who will take fresh heart from the inference that people of experience and astuteness in investment matters consider the fall in prices to have gone far enough. There has been for some time a hesitant feeling that many stocks and shares at their present levels discount as much in the way of trade recession as is likely to be seen. The fact that certain of the financial experts are apparently prepared to back this idea in practical fashion might lead to a more general inclination on the public's part to act on similar lines. Few people are likely to be led away by the impression that the new companies will start buying hand over fist to fill blank spaces in their portfolios. The more likely policy of absorbing such lines of stocks and shares as come on offer should, however, act usefully as a cushion to possible bouts of liquidation.

Share List of Electrical Companies

	Nom.	Dividend. Previous.	Dividend. Last.	Price Dec. 7.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/-	−6d.	4 8 3
Clyde Valley	1	7	8	2	—	4 0 0
County of London	1	10½	10½	49/-	+1/-	4 5 9
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	38/-	—	4 14 9
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2⅝	—	4 15 3
Elec. Supply Corporation	1	11	12	52/-	—	4 12 5
Lancs Light and Power	1	7½	7½	33/-	—	4 11 6
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	105xd.	—	4 15 3
Metropolitan	1	10	10	45/-	—	4 9 0
Midland Counties	1	7½	8	36/6	—	4 7 6
Mid. Elec. Power	1	8	9	2 1/16	—	4 7 4
North Eastern Electric Ordinary	1	6	7	32/-	+1/-	4 7 6
Do. 7% Pref.	1	7	7	34/6	+6d.	4 1 2
Northampton	1	10	10	45/-	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	47/6	+ 1/6	4 4 2
Do. do. 6% Pref.	1	6	6	30/-	—	4 0 0
Scottish Power	1	8	8	36/6	—	4 7 6
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	+6d.	7 6 4
Yorkshire Elec.	1	8	8	39/6	—	4 1 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	116	+1	4 6 2
Do. 1951–73	,,	4½	4½	109xd.	+1½	4 2 7
Do. 1963–93	,,	—	3½	98	—	3 11 6
London Elec. Trans. Gtd.	,,	—	2½	90	—	2 15 6
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A.	,,	—	4½	117½	+1½	3 16 9
Do. do. B.	,,	—	5	119½	+½	4 3 8
Do. do. C.	,,	4	4½	81	—	5 5 0
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$160	9	9	149½	+2	6 0 5
Anglo-Am. Tel. Pref.	Stock	6	6	115½	—	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4½	5½	101½	+1	5 8 5
Do. Ord.	,,	—	—	66½	+5	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	15½	+½	3 12 4
Do. do. Pref.	10	6	6	13¾	—	4 6 6
Great Northern Tel.	10	20	20	38½	+1½	5 4 0
Marconi-Marine	1	10	7½	28/9	—	5 4 4
Oriental Telephone Ord.	1	12*	12*	2½	—	4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/-	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	15½	—	—
British Electric Traction Def. Ord.	,,	5	5	1000	—	—
Do. do. Pref. Ord.	,,	8	8	160	—	5 0 0
Brazil Traction	$100	70 cts.	$1	12½	+⅜	8 3 3
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	35	—	—
Victoria Falls Ord.	1	20	12	3	+ 1/16	4 0 0
West Riding	1	6½	10	2	—	5 0 0
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	15	15	2½	—	7 0 10
Assoc. Elec. Ord.	1	8	10	45/-	+2/-	4 9 0
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	43/9	—	5 0 0
British Aluminium Ord.	1	7½	10	46/3	+ 1/16	4 6 6
British Insulated Ord.	Stock	20	20	4 1/16	—	4 5 3
Brush Ord.	Stock	Nil	Nil	24½	+2	—
Callender's	1	15	15	4½	—	3 8 9
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	2½	−½	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1 1/16	− 1/16	5 10 4
Enfield Cable Ord.	1	25	25	5 5/8	+ 1/16	4 17 8
English Electric	1	Nil	Nil	29/6	+6d.	—
Do. do. Pref.	1	6½	6½	26/0	—	5 0 0
Ericsson Tel.	5/-	20	25	2 1/16	—	3 0 8
Ever Ready	5/-	35	45	28/6	—	7 18 0
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	78/-	+1/-	4 10 0
Henley's	5/-	30	15	19/6	—	3 16 10
Do. 4½% Pref.	1	4½	4½	1½	−⅛	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	½	10	42/6	—	4 14 1
Lancashire Dynamo	1	10	20	3 5/8	+ 1/16	6 5 6
Siemens Ord.	1	6	7½	28/9	—	5 4 4
Telegraph Construction	£1	Nil	7½	2½	—	3 6 7

* Dividends are paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

3456. "Scanning-method for television and like systems." Scophony, Ltd., and F. Van Okolicsanyi. February 5th, 1936. (Cognate application 10856/36). (474970.)

3767. "Radio compasses and direction finders." G. G. Kruesi. February 8th, 1935. (474972.)

7020. "Radio navigating means for locating the position of a movable body." H. E. Sjostrand. March 9th, 1936. (475027.)

7351. "Radio receivers." Murphy Radio, Ltd., and G. B. Baker. March 11th, 1936. (475028.)

10429. "Television systems." G. E. Condliffe. April 9th, 1936. (475032.)

12734. "Wireless and like receivers." N. Atkinson. May 5th, 1936. (474906)

12803. "Electric remote-indicating systems." Standard Telephones and Cables, Ltd., and E. M. S. McWhirter. May 6th, 1936. (474980.)

13028. "Vacuum-tight seals for electric current leads into quartz." Quarzlampen Ges. May 11th, 1935. (474982.)

13035. "Electric heating units." R. H. Rogers. May 8th, 1936 (475038.)

13125. "Lighting by gas- and vapour-discharge tubes with fluorescence." Soc. Anon. pour les Applications de l'Electricité et des Gaz Rares Etablissements Claude-Paz & Silva. May 9th, 1936. (474907.)

13215. "Electric welding machines." A. J. Thorneloe. May 11th, 1936. (474916.)

13300. "Television and like systems." Baird Television, Ltd., L. R. Merdler and A. H. Gilbert. May 11th, 1936. (475046.)

13301. "Electron-discharge devices." Baird Television, Ltd., and E. B. King. May 11th, 1936. (474834.)

13302. "Electron-discharge devices." Baird Television, Ltd., V. Jones and P. W. Willans. May 11th, 1936. (475047.)

13303. "Thermionic valve oscillation generators." Baird Television, Ltd., and R. J. H. Forman. May 11th, 1936. (Cognate application 13304/36.) (475048.)

13318. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and J. A. V. Fairbrother. May 11th, 1936. (475051.)

13328. "Electric heaters for heating fluids passing through or contained in pipes, passages, or chambers." A. Lister. May 11th, 1936. (475052.)

13416. "Dynamo-electric machine." H. L. Frampton. May 12th, 1936. (474918.)

13428. "Electron-discharge devices." Baird Television, Ltd., and A. K. Denisoff. May 12th, 1936. (475100.)

13433. "Electric contactors." General Electric Co., Ltd., and W. Royle. May 12th, 1936. (475061.)

13437. "Railway signalling systems." J. Woodforde, and Westinghouse Brake & Signal Co., Ltd. May 12th, 1936. (475101.)

13458. "Slow-motion operating gear particularly applicable to controllers for electric motors." A. B. Mudie. May 12th, 1936. (475164.)

13472. "Inductance devices." Marconi's Wireless Telegraph Co,. Ltd., and D. A. Bell. May 12th, 1936. (475104.)

13473. "Radio and other high-frequency telegraph transmitters." Marconi's Wireless Telegraph Co., Ltd., and D. F. George. May 12th, 1936. (475105.)

13474. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and E. O. Smith. May 12th, 1936. (475106.)

13482. "Variable electric resistances or potentiometers." Steatit-Magnesia Akt.-Ges. May 24th, 1935. (475165.)

13496/7. "Snap-action electrical switches." J. A. Crabtree & Co., Ltd. (Schiele & Bruchsaler Industriewerke Akt.-Ges.). May 13th, 1936. (474919/20.)

13514. "Searchlights and like apparatus." Chance Bros. & Co., Ltd., and R. C. Harris. May 13th, 1936. (475167.)

13549. "Wheel-operated electric contact devices for railways and the like." Westinghouse Brake & Signal Co., Ltd. May 31st, 1935. (475111.)

13590. "Mounting arrangements for automatic switches or the like as used in telephone systems." Automatic Electric Co., Ltd. (in liquidation), R. N. Saxby and W. Saville. May 13th, 1936. (475116.)

13598. "Traffic control systems." Automatic Electric Co., Ltd. (in liquidation), T. P. Preist and G. W. Thompson. May 13th, 1936. (475118.)

13632. "Electric switches specially appliable to motor starters, and control switches therefor." Brookhirst Switchgear, Ltd., and C. Lancely. May 14th, 1935. (475122.)

13683. "Radio receivers and other apparatus incorporating a loudspeaker." G. Briggs. May 14th, 1936. (Cognate application 27199/36.) (475172.)

13813. "Methods of and means for modifying capacity effects in electrical apparatus." Kolster-Brandes, Ltd., and H. K. Robin. May 15th, 1936. (475129.)

13814. "Protective arrangements for transformers." Standard Telephones & Cables, Ltd., and H. R. Stocks. May 15th, 1936. (475130.)

13949. "Electric musical instruments with thermionic valves." Soc. E.S.L.A.M. Holding and J. Potencier. May 16th, 1936. (474838.)

13955. "Electric fires." Ferranti, Ltd., and W. V. Butterfield. May 16th, 1936. (474926.)

14018. "Control of electric lighting systems for theatres, cinemas, ballrooms, or other buildings in connection with which lighting of variable effect is required." Strand Electric & Engineering Co., Ltd., and F. P. Bentham. May 18th, 1936. (475135.)

14413. "Electric battery lamps." General Electric Co., Ltd., and F. C. Mayes. May 21st, 1936. (475065.)

14569. "System for testing and monitoring sound-recording apparatus." Electrical Research Products, Inc., and K. E. Latimer. May 22nd, 1936. (474989.)

14980. "Automatic or semi-automatic telephone and like tele-communicating or signalling systems." Panstwowe Zaklady Tele-I Radjotechniczne. May 31st, 1935. (474990.)

15090. "Multi-way electric switches." Rediffusion, Ltd., E. A. Richards and J. S. Newall. May 28th, 1936. (475143.)

15172. "Apparatus for reproducing outlines by photo-electric means." Linde Air Products Co. June 15th, 1935. (474992.)

17625. "Dynamos for pedal cycles and the like." M. Miller. June 25th, 1936. (475069.)

19669. "Electric-discharge devices with indirectly heated cathodes." M-O Valve Co., Ltd., S. M. Duke, and R. Le Rossignol. July 15th, 1936. (474933.)

20400. "Electric remote control system or apparatus for effecting synchronous working of a plurality of engines, or other mechanisms." G. D. Peters & Co., Ltd., and R. L. Goodwin. July 23rd, 1936. (474481.)

21257. "Street-lighting fittings." Holophane, Ltd., and S. English. July 31st, 1936. (474482.)

22450. "Electric circuit-breakers with automatic releasing means." Square D. Co. August 15th, 1935. (Cognate applications 22451/36 and 22452/36.) (474852.)

24004. "Means for preventing theft or unauthorised removal of electric-lamp bulbs." J. A. Brook. September 2nd, 1936. (Addition to 450077.) (474487.)

24768. "Terminal strips and test plugs for telephone systems." Siemens Bros. & Co., Ltd., and W. E. Goodwin. September 11th, 1936. (475001.)

26935. "Telephone systems." General Electric Co., Ltd., and J. E. Collyer. October 5th, 1936. (474655.)

28129. "High-frequency iron cores." E. Michaelis. October 16th, 1936. (474857.)

29462. "Electric motors." British Thomson-Houston Co., Ltd. October 29th, 1935. (474859.)

29770. "Piezo-electric crystals." Marconi's Wireless Telegraph Co., Ltd. October 31st, 1935. (474701.)

30534. "Electric bushing insulators of the condenser type." British Thomson-Houston Co., Ltd. November 9th, 1935. (474703.)

31278. "Electric incandescent lamp, and a luminous body especially adapted for use in such lamp." E. I. Lonn. November 16th, 1935. (475006.)

31742. "Control of the speed of electric motors, and their application to distant control systems." Submarine Signal Co. (London), Ltd. (Submarine Signal Co.). November 19th, 1936. (474705.)

31777. "Maximum-demand electric supply meters." Westinghouse Electric & Manufacturing Co. November 29th, 1935. (474551.)

32553. "Glass-to-metal seals." Standard Telephones & Cables, Ltd. February 4th. 1936. (474706.)

32555. "Picture transmission and television systems." Standard Telephones & Cables, Ltd. December 18th. 1935. (475008.)

33436. "Cathode-ray oscillographs and like devices." V. Zeitline, A. Zeitline, and V. Kliatchko. June 26th, 1936. (474797.)

35706. "Electrical condensers and terminals therefor." Mallory Patents Holding Co., Ltd. February 15th, 1936. (474868.)

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3529. "Synchronising arrangements for picture transmission systems, teleprinters and telewriters." Siemens and Halske, Akt.-Ges. February 5th, 1936. (475013.)

6534. "Separators for use in electric accumulators and the like." Chloride Electrical Storage Co., Ltd. June 13th, 1936. (474881.)

8202. "Jointing of coaxial-conductor electric cables." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). March 19th, 1937. (Addition to 459883.) (474953.)

9282. "Magnet systems with a uniform air-gap for use in electrical quotient meters having a large pointer deflection." Hartmann and Braun, Akt.-Ges. April 16th, 1936. (474887.)

9465. "Electrical resistance heating elements." Siemens and Halske, Akt.-Ges. April 2nd, 1936. (Cognate application 9466/37.) (474889.)

10960. "Electric-discharge devices." British Thomson-Houston. Co., Ltd. April 16th, 1936. (474890.)

13545. "Automatic circuit-breaker assemblages." Square D. Co. August 15th, 1935. (Cognate applications 13546/37 and 13547/37.) (Divided out of 474852.) (474895.)

17126. "Arrangements for automatic tuning of radio receivers or the like." E. K. Cole, Ltd. September 1st, 1936. (474967.)

20664. "Circuit-breaking devices for electrical alarm installations." C. Roth. July 26th, 1937. (474899.)

23941. "Supply arrangements for radio receivers." G. W. Johnson (Philco Radio and Television Corporation). March 11th, 1936. (Divided out of 472046.) (475088.)

29498. "Radio compasses and direction finders." G. G. Kruesi. February 8th, 1935. (Divided out of 474972.) (475090.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 1st:—

Columbus. No. 574245. Class 6. Electrical floor polishing machines and electric vacuum cleaning machines.—Elektro-Bohner Gesellschaft, Stuttgart-Bad Cannstatt, Germany (representatives, Marks and Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

Cond-Air. No. 579998. Class 6. Engines for air-conditioning plant.—Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, N.W.9.

Stabi. No. 580735; also Tripa. No. 580736. Class 6. Welding machines and parts thereof.—A. Arc, Ltd., 52a, Goldhawk Road, W.12.

Robot. No. 580733. Class 13. Electrodes and filler rods of ordinary metal for use in electric arc welding.—A. Arc, Ltd., address as above.

Capehart. No. 578521. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Capehart, Inc., Fort Wayne, Ind., U.S.A. (British representatives, Kennedy, Lindo & Co., 49, Queen Victoria tSreet, E.C.4).

Lumax. No. 580028. Class 13. Anodically treated aluminium reflectors.—Curtis Lighting Co. of Great Britain, Ltd., Aldwych House, Aldwych, W.C.2.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses, Powis and Middlefield (£35,900); city architect.

Aspull.—Houses (50), near Wigan Road; J. Gaffney & Son, builders, Wigan.

Barrow-in-Furness.—Houses (42), Balmoral Drive; Russell Bros., Ltd. Houses (50), Harrogate Street; Miss F. C. West. Houses (26), Hawcoat Lane; J. Parkinson & Sons, Ltd. Houses (142), Hollow Lane; T. Mellor. Houses (44), near West Avenue; A. Peet.

Bedlington.—Houses (206); J. W. Pooley, U.D.C. surveyor.

Berkhamsted.—Cinema, Egerton House, for Shipman & King; Fassnidge, Son & Norris, Ltd., contractors, 267, High Street, Uxbridge.

Birkenhead.—Cinema, Bebington Road; Cheshire Picture Halls, Ltd.

Birmingham.—Houses (287), Mill Pool Hill estate, King's Heath (£100,507); Alfred Langley, Ltd., Manor Farm Road. School, Perry Barr, for the E.C.

Bishop Auckland.—Cinema, the Green, for Picture House (Billingham), Ltd.; J. Clayton, architect, High Road Chambers, Darlington.

Blackpool.—Houses (46), Bispham estate, for the Housing Committee; W. Banks, borough surveyor. Houses (28), Blairway Avenue; T. Parkinson. Houses (12), Napier Avenue; E. D. Dennis. Houses (21), South Shore estate; W. H. Airey. Houses (37) and garages, Townsley Avenue; T. Southworth, builder, 9, Honister Avenue, Marton. Houses (59) and garages, Waverley Avenue, Norcliffe Road and Poulton Road; R. Fielding & Son, building contractors, Stanhope Road works. Cinema and shops, Red Bank Road and Devonshire Road; T. L. Hay. Rebuilding Casino, Promenade; Blackpool Pleasure Beach, Ltd.

Bridgwater.—Carpet factory for Brintons, Ltd., Kidderminster; Wallis Gilbert & Partners, architects, Buckingham Palace Road.

Brighouse.—Houses (48); A. Day, Bradford Road, Bailiffe Bridge.

Bristol.—School, Doncaster Road, Southmead, for the E.C.; Messrs. Gleeds, Corn Street, Bristol, 1.

Cardiff.—Extensions to works, North Street; Leyland Motors, Ltd.

Carlisle.—Schools, Currock, for the City E.C.; city engineer, 18, Fisher Street, Carlisle.

Chelmsford.—Houses (28), Mountnessing; R.D.C. surveyor, Council Offices, Waterloo Lane.

Cheltenham.—Houses (42), Clevelands estate; R. J. Hunt, architect, Harrow.

Chichester.—Houses (42), Kingsham Avenue; F. C. Nash, city sanitary inspector, Council Offices, North Street.

Darlington.—Alterations to Municipal Hospital (£27,000); borough engineer.

Derbyshire.—Extensions to the Clowne Mining and technical institute; J. Harrison, county architect, Derby.

Dewsbury.—Swimming bath (£33,000), Wheelwright Street; borough architect and surveyor, Town Hall.

Dudley.—Houses (208), Rossland estate; Henry Boot & Sons, Ltd., Sheffield. Houses (144), Cole Street site; borough engineer.

Eastbourne.—Development of Rodmill Farm estate; Chatsworth Estates Co.

Edinburgh.—Houses (24), Burdiehouse Road, for Corporation; city architect. Houses (38), Craigcrook Road; Mactaggart & Mickel, Ltd., 67, York Place, Edinburgh, 1.

Enfield.—School, Green Street, for the E.C.; F. Lee, architect, Percy House, 7, Little Park Gardens.

Freshwater.—Library (£3,000); Isle of Wight county architect, Newport.

Gateshead-on-Tyne.—Maternity clinic (£14,570); F. H. Patterson, architect, borough surveyor.

Gosport.—Schools, Privett Road (£28,873), for the E.C.; Crosby & Co., Ltd., builders, Farnham, Surrey.

Grantham.—Houses (90), Cherry Orchard estate; borough surveyor.

Greenock.—Shops and flats, at the corner of Hamilton Street and Charles Street; Montague Burton, Ltd., Leeds.

Guildford.—Houses (120), Westborough (£38,322); H. Ashenden.

Heanor.—Houses (16), Elmsfield estate; C. Grace. Houses (12), Hands Road; H. Slaney.

Hertfordshire.—School, Knutsford Avenue, Watford, for the C.C.; county surveyor and architect, Hatfield.

Ince-in-Makerfield.—Houses (80), Church Street, Ince; Thornley & Painter, Bishopgate, Wigan.

Irish Free State.—(MACROOM, Co. CORK).—Houses (26); W. L. Kelleher, engineer, Rockbone, Inniscarra, Co. Cork.

Jarrow-on-Tyne.—Drapery store, Norham Terrace, for the Jarrow and Hebburn Co-operative Society; G. C. Young, 12, Grange Road West. Schools, Monkton and Simonside; borough engineer.

Lancaster.—Omnibus station, Damside Street, for Traffic Committee; F. Hill, city surveyor, Town Hall.

Leeds.—Library, Cross Gates (£18,634); R. M. Thompson, Ltd., builders, Woodhouse Lane, Leeds.

Lingfield.—Cinema for New Era Cinema Co.

London.—(CAMBERWELL).—Factory and warehouse, 90-92, Peckham Road, for London Association for the Welfare of the Blind; Nox, Ltd., contractors, 55, New Bond Street, London, W.1. (ISLINGTON).—Flats, Highbury Quadrant (£275,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (OXFORD STREET, W.1).—Block of offices and showrooms, Market Place (£500,000); G. E. Wallis & Sons, contractors, Maidstone, Kent. (SHOREDITCH).—Tenements, Britannia Gardens (£67,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (STOKE NEWINGTON).—Flats, Hewling Street (£59,752); C. Miskin & Sons, Ltd. Reconstruction of Alexandra Theatre; T. Braddock, 655, Grand Buildings, W.C.2. (WOOLWICH).—Extensions to works, Henley Road; Standard Telephones & Cables, Ltd.

Mansfield.—Cinema, Elmton Road, Creswell, for the Warsop Theatre Co., Ltd.; Bocock & Kirk, architects, Westfield Drive. Alterations to Palace cinema, Leeming Street; Sherwood Palace, Ltd.

Middlesex.—Technical institute, Enfield (£90,000), for the C.C.; Kent & Sussex Building Co., contractors, Erith, Kent.

Murton (CO. DURHAM).—Cinema for the Empire Picture Co., Ltd., Back Woods Terrace.

Newcastle-on-Tyne.—Houses (18), Ayton Street; L. Ather, builder, Durham Road, Low Fell, Gateshead-on-Tyne. Rebuilding of the Adelaide Hotel for R. Charlton; J. Oswald & Sons, architects, Bradburns Chambers, Northumberland Street.

Northampton.—Houses (18), Duston Road; Chowns, Ltd. Houses (120), Thornton Road; T. Wilson & Son, Ltd. Extensions to factory, Countess Road; Hanwell Engineering Co., Ltd.

Nuneaton.—Houses (154), Stockingford; R. C. Moon, surveyor, Council House.

Oswaldtwistle.—Houses (48), Trinity Street site (£17,371); R. W. Myers, builder, Harwood Road, Rishton.

Oxford.—Flats and offices, for Senate of Oxford University; H. Hughes, architect, Douglas Street, Glasgow.

Oxfordshire.—County offices, Oxford; county architect.

Plymouth.—Houses (36), Churchway; Davis Estates, Ltd. Houses (18), Ladysmith Road; J. Rendle. Flats (48), Stonehouse (£25,920); Pearn Bros., Ltd. Two branch libraries; city engineer. Reconstruction of City hospital; Edwin Hoare & Partners, heating engineers, Bristol. Rebuilding of Prince Rock school (£16,595); A. N. Coles, Ltd.

Pontefract.—Houses (52), Chuchwalk estate (£27,920); Leach Bros., Ltd. Houses (30), Churchwalk Lane; A. Hindle.

Rotherham.—Houses (45), near Broom Lane; G. Bilton & Son. Houses (18), East Bawtry Road; Saville & Co.

Sheffield.—Houses (33), Boynton Street and Hammerton Road, for Simpson Bros., Bessingby Road. Houses (282), Parsons Cross estate (scheme No. 11); W. G. Davie, city architect, Town Hall. Houses (25) and reading rooms, Bunting Nook, for John Eaton's Trustees. Houses and garages, Button Hill and Kingsley Park Grove; Cussins, Ltd., 69, High Street.

Shipley.—Houses (44), Lindisfarne Road; H. Chippindale. Houses (41), Nab Wood Crescent; J. Chippindale.

South Shields.—Additions to the general hospital (£3,000); borough engineer. Extensions to factory, for L. Wright and Sons; Wright, Anderson and Co., builders, Gateshead-on-Tyne.

Staffordshire.—Schools, Penzer Street, Kingswinford, Gaol Butts, Eccleshall, and Leek, for the C.C.; F. A. Hughes, director of education, County Education Offices, Stafford.

Stockport.—School, Vale Road, Reddish, for the E.C.; L. Yates, architect, Town Hall.

Strood (KENT).—Factory and stores, for British Sisalkraft, Ltd.; Fuller, Hall & Foulsham, architects, 212, High Holborn, London, W.C.1.

Sunderland.—Alterations and improvements to premises, Messrs. Jackson, High Street; F. J. Hepple, contractor, Dunn Street, Newcastle-on-Tyne.

Sussex.—School, Health Centre, &c., Littlehampton, and extensions to High School for Girls, Chichester, for the West Sussex County Council; C. G. Stillman, county architect, County Hall, Chichester.

Sutton Coldfield.—Houses (16), Maney Hill estate; R. Shaw. Houses (12), Westwood Road; H. R. Oldham.

Tewkesbury.—Houses (38); W. Ridler, borough surveyor, Station Street.

Tunbridge Wells.—Houses (158), Oak Road estate; H. P. Bishop, borough surveyor, Calverley Mount.

Tynemouth.—Block of 135 flats for Sir James Knott Memorial Trust; Stanley Miller, Ltd., builders, 17, North Street, Newcastle-on-Tyne.

Uxbridge.—Houses (£19,653); E. J. G. Morgan, contractor, New Denham.

Ventnor (I.O.W.).—Cinema; Isle of Wight Theatres, Ltd.

Warrington.—Rebuilding of Botelier Grammar school (£67,204), for the E.C. Houses (91), Hallows Avenue; R. & S. Smith.

Wembley.—Council offices (£157,565); borough engineer.

West Bromwich.—Extensions to Charlemont Council school; A. O. Chatterley, architect, 41, Water Street, Birmingham, 3.

Whitby.—Houses (30), Staithes; W. Rovinson, architect, "Southfield," Glaisdale.

Worthing.—Houses (87), Findon Road; Monks Farm Estate, Ltd. Houses (17), Leeward Road; Willmore Phillips. Shops, Chapel Street (£11,000); Mark Hauser.

York.—Houses (66), Holly Bank estate; Holly Bank Estate Co. Cinema, Clifton; Clifton Picture House, Ltd. School, Manor site; York Diocesan Board.

E.A.W. Activities

The Plymouth and District Branch of the Electrical Association for Women held its annual luncheon on November 30th at the Continental Hotel, Councillor Mrs. C. H. Daymond presiding. Among those who attended were the Lord Mayor and Lady Mayoress, Alderman and Mrs. Solomon Stephens; Miss C. Haslett, director of the E.A.W.; Mr. J. T. H. Legge, manager, S.W. England and S. Wales Area, Central Electricity Board; Mr. H. Midgley, city electrical engineer; and Mr. F. G. Leatherby, chairman of the Electricity Committee.